REVISION OF AMERICAN PALEOZOIC INSECTS.[a]

By Anton Handlirsch,

Adjunct Curator of the Royal Imperial Natural History Museum, Vienna, Austria.

INTRODUCTION.

During many years the late Mr. R. D. Lacoe, of Pittston, Pennsylvania, was an ardent collector of plants and insects. Until recently but one locality in the United States yielded specimens of Paleozoic insects in numbers sufficient to warrant collectors to look for these rarest of fossils. This locality is along Mazon Creek, in Grundy County, Illinois, where the nodules have weathered out of the Upper Carboniferous shales. Mr. Daniels tells the present writer that about one insect is found to every 1,000 concretions, and were it not for the splendid plants and the rare invertebrates found inside the other 999 nodules no collecting at all could be done. For many years Mr. Lacoe offered a premium for every nodule containing an insect, arachnid, or myriapod, and eventually he was enabled to assemble 70 insect-bearing concretions. These were partially described by Prof. S. H. Scudder, and now all of them have been studied by Prof. Anton Handlirsch.

In the plant-bearing beds of the anthracite and bituminous regions Mr. Lacoe occasionally secured a single insect wing, and when the finds became sufficient to warrant digging for them he would specially detail a collector to examine the shales of a given locality. Rarely did such work yield more than a few insect wings each day, but after long perseverance about 625 specimens were collected.

With the greatest generosity all this material was presented by Mr. Lacoe during his lifetime to the U. S. National Museum, on condition that the collection should be made accessible to paleontologists and that he be allowed to add further material from time to time. Unfortunately for science, he lived but a few months after making this splendid gift, and it will probably be a long while before another person so generous, large-hearted, and financially equipped will give of his time and talents so abundantly for the furtherance of this branch of paleontology.

---

[a] Translated from the German by Lucy Peck Bush, librarian and assistant, geological department, Yale University Museum.

Owing to the large collections of Carboniferous fossil plants made for the U. S. Geological Survey, chiefly by Mr. David White, a number of other specimens of insects have been secured; these are also included in the present work.

As continued illness and other causes have prevented Dr. Samuel H. Scudder from making a complete study of the Lacoe collection of Paloezoic insects, the writer often expressed the hope that some one might be found to investigate this very interesting material, but as no one of the American entomologists working in recent forms could be induced to make a study of these fossils, he despaired of ever getting an expert and competent hand to monograph the collection.

The material thus lay in obscurity for a few years, when Professor Handlirsch, of the Royal Imperial Museum of Austria, requested the loan of certain of Scudder's type specimens. A rule of the U. S. National Museum forbids the loan of "types" from Washington, but after the full scope of Doctor Handlirsch's work became known the authorities made an exception in this case to that wise ruling, and asked to be allowed to lend all the Paleozoic insect material in the National Museum for incorporation in the Monograph of Paleozoic Insects by Professor Handlirsch. The entire collection was therefore sent to him in the summer of 1902.

Mr. L. E. Daniels, formerly of Morris, Illinois, now of Laporte, Indiana, was also for many years engaged in making a collection of the forms found in the nodules of Mazon Creek, and this he will eventually present to the National Museum. With a liberality second only to that of the late Mr. Lacoe, Mr. Daniels likewise consented to loan his insect material for the work in question. The collection includes 16 nodules.

Hence, the majority of American Paleozoic insects have been studied by Professor Handlirsch. Only one other large collection, that assembled by the late Prof. O. C. Marsh, and now the property of Yale University Museum, has not been seen by him. This collection, also, would have been sent to Professor Handlirsch had it not been in the hands of Dr. E. H. Sellards, whose studies are not yet completed.

The paleontology of America has thus been greatly benefited. The work of Professor Handlirsch indicates plainly that his genera and species are more finely drawn than those of the Americans, but this is due in part to the larger collections at his disposal and the monographic nature of his work. It will be also noted that his arrangement of the genera into families, and the lines of descent, are often at variance with those of Doctor Scudder.

The U. S. National Museum is deeply indebted to Prof. Anton Handlirsch and to the authorities of the Royal Imperial Museum at Vienna for this very valuable work.

CHARLES SCHUCHERT.

REVISION OF AMERICAN PALEOZOIC INSECTS.

Through the long-continued activity of Dr. S. H. Scudder a great number of forms of fossil insects from the American Paleozoic rocks have become known to us, and interest in this branch of paleontology has thus been widely increased. As a result, new collections of these organisms, which have furnished valuable material for study, have been secured from many sources. A large share of these new specimens is in the possession of the U. S. National Museum, and to me has been intrusted the working up of this collection. This unusual privilege has placed me under the greatest obligations, since without the investigation of this valuable material it would have been hardly possible to complete in a satisfactory manner my general studies on the paleontology and phylogeny of insects.

Several years of research have furnished me proof that Scudder's classification required a thorough revision, because his groups include mainly quite heterogeneous elements and morphologically are not founded on sufficiently broad lines. Hence, the paleontology of insects, in a wider sense, could not be previously employed in phylogenetic conclusions.

If I have now succeeded in rightly interpreting various errors, and have obtained a more exact description of forms and a sharper delimitation of groups, I am indebted not only to the abundance and richness of the existing European and American material, but especially to the progress which has been recently made in the domain of insect morphology, and particularly to the fundamental investigations of Comstock and Needham on the venation of the wings of insects. As a result of these studies, the establishment of homologies seems to be divested of its greatest difficulties.

I can not close this introduction without acknowledging my deepest obligations to the administration of the U. S. National Museum, as well as to Prof. Charles Schuchert, now of Yale University Museum, but formerly assistant curator, division of stratigraphic paleontology in the National Museum, and to Messrs. David White and L. E. Daniels, not only for the magnificent collections placed at my disposal, but also for valuable aid and advice.

Mr. David White has had the kindness to prepare the following comprehensive statement of the geological relations of the American Paleozoic, as far as the insect-bearing deposits are concerned. With these data at hand, the relative age of individual forms can now be much more accurately determined and compared with European discoveries.

GEOLOGICAL POSITION OF THE PRINCIPAL INSECT-BEARING LOCALITIES OF THE AMERICAN PALEOZOIC.

The American specimens of Paleozoic insects have been generally brought to light in the search for fossil plants, and accordingly they are geologically referred to more or less well-known plant beds. Exceptions are those from the shales above the Ames (Crinoidal) limestone at Richmond and Steubenville, Ohio. It must be remembered that for stratigraphical or areal purposes various formations have been recognized in more or less distant areas of the American coal fields, and the exact interequivalence of these has in many cases not yet been ascertained. The anthracite coal fields also have a stratigraphical nomenclature for the most part different from that in use in the bituminous regions, the subdivisions being largely according to the grouping of the coal beds or "veins," which in the Northern Anthracite field (Pennsylvania) are lettered from the base upward.

In the following list the geological formation and horizon or stage, so far as the latter has been determined by paleobotanical or stratigraphical correlations, will be given in connection with the designation of each locality. In a number of instances a locality has been cited in various papers in different terms, which have sometimes been erroneously interpreted to mean distinct places. Such cases will be pointed out below:

1. Near Altamont No. 1 Colliery, anthracite region, Pennsylvania. Lower Pottsville; Lower Lykens group. Waldenburg-Ostrauer. (="Lower Lykens of Pottsville, Altamont Colliery, Pennsylvania.")
2. Boston mine, near Pittston, Pennsylvania. Near top of Pottsville series; Upper Transition group. Lower Westphalian. (="Lowest productive c. m., Boston mine near Pittston, Pennsylvania.") (="Roof shales of coal C, Boston mine.") (="Upper Coal Measures (coal C) Boston mine.")
3. Butler mine, near Pittston, Pennsylvania. Anthracite series; Pittston or E coal. Lower Stephanian. This coal lies paleobotanically in or near the Freeport stage of the Allegheny formation of the bituminous coal fields of Pennsylvania. (="Pittston coal in the Butler mine at Pittston, Pennsylvania.")
4. Campbell's Ledge, near Pittston, Pennsylvania. Near top of Pottsville; Upper Transition group. Lowest Westphalian. (="Interconglomerate of Millstone Grit of Campbell's Ledge, Pittston, Pennsylvania.") (="Interconglomerate Upper Coal Measures, Campbell's Ledge, Pittston, Pennsylvania.") (="Upper Coal Measures, Upper Campbell's Ledge, Pittston, Pennsylvania.")
5. Cannelton, Pennsylvania. Allegheny formation: Kittanning group; roof of the Middle Kittanning coal. Westphalian. (="Bituminous coal shale of the Lowest Productive Coal Measures, Cannelton, Pennsylvania.")
6. Cassville, West Virginia. Dunkard formation; parting in the Waynesburg coal. Probably Autunian.

Note.—The main body of the Waynesburg coal bed forms the topmost stratum of the Monongahela formation. But, for convenience in grouping, the richly plant-bearing shale parting in the upper part of the coal was placed, with the top shale and sandstone, in the base of the Dunkard formation. The formation (Dunkard) was referred, in 1880, by Professors Fontaine and I. C. White, to the Permian. This reference has been doubted by most American geologists. Recently, however, additional plant evidence has been obtained to show that the beds above the Washington coal, 175 feet above the Waynesburg coal, are clearly Lower Rothliegende (cf. Cuseler); and it is not impossible that the Rothliegende boundary may, on the acquisition of further paleontological material, be shown to lie unquestionably below the Waynesburg coal. (="Lower Permian Cassville, West Virginia, Waynesburg coal.")

7. Clendennin, West Virginia. Charleston sandstone formation. The plant bed furnishing the insect remains is probably nearly of the age of the Kittanning group in the Allegheny formation in Pennsylvania. Westphalian.
8. Drake Tunnel, Old Forge, Pennsylvania. Anthracite series; Marcy or D coal. This bed probably falls in the stage of the Kittanning group of the Allegheny formation of the bituminous regions. Westphalian. (="Middle Coal Measures (Marcy or D) Drake Tunnel, Old Forge, Pennsylvania.")
9. Empire mine, Wilkes-Barre, Pennsylvania. Anthracite series; E coal. Referable to Freeport group of the Allegheny formation in the bituminous regions. Stephanian.
10. Fishing Creek Gap in Sharp Mountain, Pennsylvania. Anthracite series; lower part; horizon undetermined. Stephanian ?
11. Frog Bayou, Arkansas. Upper Coal-bearing Division. Probably included in the Allegheny stage of Pennsylvania. Westphalian ?
12. Gibson Fork, near Decota, West Virginia. Upper Pottsville; Lower Kanawha series. Probably near stage of the Sharon group in Ohio and Pennsylvania. Westphalian.
13. Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales; regarded as near or at the stage of the Conemaugh formation, or possibly as old as the Freeport group of the Allegheny formation. Stephanian.
14. Lemon's Coal Mine, near Fayetteville, Washington County, Arkansas. Middle Pottsville; Lower Coal-bearing shale. Referable to the Sewanee (Sewell) stage, in the Appalachian trough. Waldenburg-Ostrauer.
15. Lorberry Gap, in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series; stage undetermined. Stephanian ? (="Buck Mountain coal, Lorberry Gap, Lorberry, Pennsylvania.")
16. Switchback, near Pittston, Pennsylvania. Anthracite series; D? coal. Belongs to Allegheny stage in bituminous regions. Westphalian.
17. Port Griffith, Pennsylvania. Anthracite series; E coal. Freeport stage of the Allegheny formation in the bituminous regions. Stephanian.
18. Pottsville, Pennsylvania. Anthracite series; stage unknown. Westphalian ?
19. Scranton, Pennsylvania. Uppermost Pottsville; Dunmore coal No. 2. Referable to Mercer stage of Allegheny formation. Westphalian.
20. Tallmadge, Ohio. Upper Pottsville; Sharon shales. Lower Westphalian. (="Lowest coal bed, Tallmadge, Ohio.")
21. Near Tremont, Pennsylvania. Pottsville; Lykens series; stage unknown. Waldenburg-Ostrauer ? (="Lykens Coal Measures, Tremont, Pennsylvania.")
22. Tremont, Pennsylvania. Anthracite series; Mammoth coal. Probably in Freeport stage of Allegheny formation of bituminous regions. Lower Stephanian?
23. Tremont, Pennsylvania. Anthracite series; Buck Mountain coal. Clarion stage of Allegheny formation of bituminous regions. Westphalian.
24. Yatesville, Pennsylvania. Anthracite series; D coal. Referable to the Freeport stage of the Allegheny formation in the bituminous region. Stephanian.

25. Wills Creek, near Richmond, Ohio. Conemaugh formation; shales above the Ames limestone. Stephanian. (= "Lower Barren Coal Measures, Wills Creek.")
26. Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone. Stephanian.

    NOTE.—These shales are about 600 feet below the plant and insect bed at Cassville, West Virginia (No. 6 above).
27. Pratt Mines, near Birmingham, Alabama. Middle Pottsville; Pratt group; probably Sewell stage. Waldenburg-Ostrauer. (= "Coal Measures, Pratt Mines, Birmingham, Alabama.")
28. Cordova, Alabama. Middle (?) Pottsville; Mary Lee group; Upper Quinnimont ? stage. Waldenburg-Ostrauer.
29. Coalburg, Alabama. Middle Pottsville; Pratt group; probably Sewell stage. Waldenburg-Ostrauer. (= "Lower Coal Measures, Coalburg, near Birmingham, Alabama.")
30. Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage. Highest Westphalian or low Stephanian. (= "Lowest Productive Coal Measures, Mazon Creek, Illinois.")
31. Colchester, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage. Highest Westphalian or low Stephanian.
32. Braidwood, Illinois. Pennsylvanian; Conemaugh ? stage. Stephanian.
33. Danville, Illinois. Pennsylvanian Conemaugh (or Freeport ?) stage. Stephanian.
34. Little Vermilion River, Vermilion County, Illinois. Pennsylvanian; Allegheny ? stage. Westphalian ?
35. 170 feet above the base of the Upper Coal Measures, near Kansas City, Missouri. Chanute shales; Conemaugh ? stage; Lower Stephanian. (= "Upper Coal Measures, Kansas City, Missouri.")
36. Clinton, Missouri. Cherokee shales; Kittanning (Allegheny) stage. Westphalian. (= "Very lowest Productive Coal Measures, Clinton, Missouri.")
37. Gilkerson Ford, Henry County, Missouri. Cherokee shales; Kittanning (Allegheny) stage. Westphalian. (= "Lowest Coal Measures, Gilkerson Ford, Clinton, Missouri.")
38. Near French Lick, Indiana. Middle Pottsville; Mansfield formation; Quinnimont ? stage. Waldenburg-Ostrauer. (= "Carboniferous. Orange County, Indiana.")
39. Braxton Quarry, near French Lick, Indiana. Middle Pottsville; Mansfield formation; Quinnimont ? stage. Waldenburg-Ostrauer. Probably same locality as 38. *Paolia vetusta.*
40. Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; probably Allegheny or Conemaugh stage. Stephanian ? (= "Lower ? Productive Coal Measures, Pawtucket, Rhode Island.") (= "Coal Measures, Pawtucket, Rhode Island.")
41. Silver Spring, East Providence, Rhode Island. Pennsylvanian; Ten-mile series; Allegheny or Conemaugh stage. Stephanian ? (= "Lowest (?) Productive Coal Measures, Silver Spring, East Providence, Rhode Island.")
42. East Providence, Rhode Island. Pennsylvanian; Ten-mile series; Allegheny or Conemaugh stage. Stephanian ?
43. Fenners Ledge, Cranston, Rhode Island. Pennsylvanian; near base of section; stage unknown. Westphalian ? (= "Lower (?) Productive Coal Measures, Fenners Ledge, Cranston, Rhode Island.")
44. Cranston, Rhode Island. Pennsylvanian; near base of section; stage unknown. Westphalian ?
45. Bristol, Rhode Island. Pennsylvanian; probably Allegheny or Conemaugh stage. Stephanian ? (= "Lowest Productive Coal Measures, Bristol, Rhode Island.")

46. Fairplay, Colorado. Permo-Carboniferous.

    The plant and insect beds at Fairplay, referred by Doctor Scudder to the Trias, and by Lesquereux to the Permian, can, on the evidence of the plants, not be regarded as later than Permian, if indeed they are above the highest Coal Measures. Autunian ?

47. Sydney, Cape Breton. Middle Coal formation; Allegheny stage ? Upper Westphalian ? (="Very lowest Productive Coal Measures, Sydney, Cape Breton.")
48. Main Coal, East River, Picton, Nova Scotia. Pennsylvanian; Stephanian ?
49. St. John, New Brunswick. Little River group (Devonian ? ?).

    These plant beds were referred by Sir William Dawson to the Middle Devonian and are regarded as of that age by most Canadian geologists, the stratigraphy of the beds being interpreted as conclusively indicating such a reference. On the evidence of the fossil plants entirely, they are considered by Mr. R. Kidston and myself as certainly Carboniferous, and probably of Lower Coal Measures (of Great Britain) or Pottsville (in America) age.

The general geological and age relations of the insectiferous beds, so far as these relations have been correlatively ascertained, are shown in the following table, in which the respective localities, when admitting of approximate correlation, are designated by numbers. (Exceptions are Nos. 10, 15, 18, 40–42, 46, 48, 49.)

David White.

Appalachian Coal Measures, as correlated by the fossil floras.

[The numbers are those given in the foregoing list of localities.]

		Central Appalachian region.	Northern Appalachian bituminous region.	Anthracite region.	European divisions.		
Pennsylvanian. (Upper Carboniferous.)	Permian.	[Wanting.]	Dunkard. 6.	[Wanting ?]	Autunian.	Lower Rothliegende.	Cuseler.
	Coal Measures.	Braxton.	Monongahela. (Upper Productive Coal Measures.) Conemaugh. (Lower Barren Measures.) 13, 25, 26, 32?, 33?, 35?, 45?.	Anthracite series. Coals A, B, C, etc. Coal E. 3, 9, 17, 22?.	Stephanian.		Commentry. [Ottweiler.]
		Charleston.	Allegheny. (11) (43?) (44?) (47?) Freeport. Kittanning. 5, 30?, 31?, 34?, 36, 37, 7? Clarion.	Coal D. 8, 16, 24. Coal C?. 23.	Lower Coal Measures, Great Britain.	Westphalian.	[Saarbrückian.] Valenciennes. [Schatlarer.]
		Kanawha.	Homewood. Mercer Group. 12, 19. Conoquenessing Shales. 20. Sharon Conglomerate.	Upper Transition series. 2, 4.			
		Nuttall. Sewell. (14), 27, 29. Raleigh. Quinnimont. 28?, 38?, 39. Clark. Pocahontas.	[Discordance].	Upper Lykens series. (21?) Lower Transition series. Lower Lykens series. 1. (Discordance ?)	Millstone Grit.	Waldenburg-Ostrauer.	
Mississippian. (Lower Carboniferous.)		Mauch Chunk Shales. Greenbrier Limestone. Pocono (conglomerates, shales, and coals). =Horton series of Nova Scotia.			Yoredale. Mountain Limestone. Calciferous Sandstone. Series of Scotland.		
		Devonian.					

SYSTEMATIC REVIEW OF THE INSECTS AT PRESENT KNOWN FROM THE AMERICAN PALEOZOIC.

The following pages contain an abridged characterization of the orders and families into which American Paleozoic insects are divided; further, an enumeration of all forms previously made known, with amended names and localities, as well as the descriptions of 137 new species from the collection of the U. S. National Museum and that of Mr. L. E. Daniels. In the treatment of the species already known, I have confined myself strictly to necessary critical observations and important references to literature. For detailed descriptions and figures of these species the reader is referred to my larger work, that will shortly appear; but for citations, to Scudder's catalogue. The figures of the new species have all been prepared by myself with the aid of the camera lucida; hence are claimed to be accurate. All reconstructions have been completed chiefly in stippled lines only, perplexing details of the matrix, flaws, and other things not pertinent to the fossil being omitted. In the description of the neuration of the wing I have made use of the terminology proposed by Comstock and Needham merely for the principal veins (C=costa, Sc=subcosta, R=radius, Rs=radial sector, M=media, Cu=cubitus, A=anal), the homologies of which I have been able to determine in all recent and fossil insects. On the other hand, the branches of the main veins and the cross veins I have not been able to homologize; the numbers adopted, therefore, are of value only for the species concerned and have no higher morphological significance.

My views on the system of recent insects have been already set forth in the publications of the Royal Imperial Academy of Vienna and in the Zoologischer Anzeiger (1904).

Class PTERYGOGENEA (Brauer) Handlirsch.

Order PALÆODICTYOPTERA Goldenberg.

Generally slenderly built insects, with 4 similar membranous wings which are independent of each other and move only in a vertical direction, their veins almost exactly corresponding to those in the hypothetical type constructed by Comstock and Needham.[a] Costa marginal, not branched; subcosta independent, not far removed from the costa, not furcate; radius simple, preserved to the tip; radial sector springing forth from the radius more or less near to the base of the wing, and dividing in various ways, its branches mainly continuing obliquely to the apical border. Media and cubitus generally with a simple or slightly dichotomous anterior branch and a more strongly branching

---

[a] See American Naturalist, 1898–1899.

inferior member; their branchlets are always more or less strongly arcuate and directed backward; anal veins always well developed, more or less branched and curved back to the inner margin; almost without exception, cross veins are abundantly developed and irregularly distributed. Anal area neither separated by a fold nor enlarged by fanlike plaitings. Pterostigamata, cross folds, and intersections of the veins, as well as all other higher specializations occurring in recent insects, are wanting in all Palæodictyoptera. The head is moderately large, with eyes distinctly developed and rather long simple antennæ. Mouth parts fitted for chewing. Three similar thoracic segments, the first mostly with winglike pleurites. Abdomen sessile, slender, and uniformly segmented; the sides of the segments often with persistent tracheal gills or similar processes. Legs homonomous, fitted for running, with 3 to 4 tarsal joints. Eleventh segment with more or less long cerci.

The larvæ of the Palæodictyoptera were similar to the imago, and developed their wings gradually without resting stages; they probably lived in the water as predaceous animals.

This order is exclusively Paleozoic and includes the oldest fossil insects at present known. This fact, taken in connection with the very primitive organization, especially with the lack of all specialized structures, leads me to seek in the Palæodictyoptera the ancestors of all other orders of insects.

Family DICTYONEURIDÆ Handlirsch.

I consider the genus *Dictyoneura* Goldenberg the type of this family. The wings of the Dictyoneuridæ are distinguished by a very irregular reticulate intercalary neuration, and have feebly divided principal veins. As a rule the radial sector, as well as the cubitus and the media, always separate into not more than from 4 to 6 branches.

A group prevailing throughout the middle and upper parts of the Uppe Carboniferous of Europe.

HAPLOPHLEBIUM Scudder.

HAPLOPHLEBIUM BARNESII Scudder.

Haplophlebium barnesii Scudder, Proc. Boston Soc., XI, 1867, p. 151; Geol. Mag., IV, 1867, p. 386, pl. XVII, fig. 1.

Dictyoneura haplophlebia Goldenberg, Fauna saraep. foss., II, 1877, p. 16.

Haplophlebium barnesii Brongniart, Fauna ent. terr. prim., 1893, p. 504, pl. III, figs. 4, 5.

Locality. Sydney, Cape Breton. Allegheny stage?

This fossil has been referred by Scudder to the protophasmids (orthopteroid Palæodictyoptera).

MAMMIA, new genus.

Costal border gently curved. Costal area narrow. Radius situated nearer the subcosta. Radial sector arising about in the middle of the wing. The media sends off its very strongly arcuate anterior branch just before the origin of the radial sector, which it approaches and then continues in a large curve backward. The posterior branch of the media again furcates at about the level of the origin of the radial sector. The cubitus is already divided very near the base of the wing, its branches, as well as the first anal vein, extending in a broad curve to the inner margin. The intercalary neuration consists of a close irregular network.

MAMMIA ALUTACEA, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning? (Allegheny) stage.

The fragment, 24 mm. long, of a wing from 40 to 50 mm. in length.

Holotype.—Cat. No. 38829, U.S.N.M.

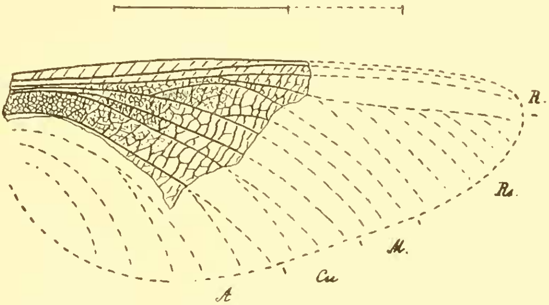


Fig. 1.—Mammia alutacea.

Notwithstanding the incompleteness of this specimen I believe it possible to regard it as nearly related to the European Dictyoneuridæ.

TITANODICTYA, new genus.

TITANODICTYA JUCUNDA (Scudder).

Titanophasma jucunda Scudder, Proc. Amer. Acad., XX, 1885, p. 169.
Dictyoneura jucunda Brongniart, Bull. Soc. Rouen (3), XXI, 1885, p. 62.

Locality.—Campbells Ledge, near Pittston, Pennsylvania. Upper Transition group, near top of Pottsville.

This form, as yet not figured, is closely allied to the genus *Dictyoneura* Goldenberg.

The genus *Titanophasma* Scudder is different from Brongniart's genus of the same name, and must therefore receive a new name. Scudder ranks this form, also, with the protophasmids.

Holotype.—Cat. No. 38154, U.S.N.M.

GEREPHEMERA Scudder.

GEREPHEMERA SIMPLEX Scudder.

——— ——— Scudder, Geol. Mag., V, 1868, p. 174.

Gerephemera simplex Scudder, Devon. Insects, N. B., 1880, p. 12, pl. I, figs. 8, 8a.

Gerephemera simplex Hagen, Bull. Mus. Comp. Zool., VIII (14), 1881, p. 277; Zool Anz., VIII, 1885, p. 298.

Gerephemera simplex Brongniart, Bull. Soc. Rouen (3), XXI, 1885, p. 56.

Gerephemera simplex Brauer, Anal. Hofmus. Wien, I, 1886, p. 111.

Locality.—St. John, New Brunswick. Little River group; = ? Pottsville.

This is one of the so-called Devonian insects which gave rise to the lively controversy between Scudder and Hagen. The former at first regarded it as an ephemerid, but later founded a distinct family upon it, which he named "Atocina," and classed with the protophasmids. Hagen, on the other hand, desired to make an odonate of the fossil at any cost, and sought to establish this view in several very polemical writings, without, however, attaining the desired result.

In my opinion, the specimen probably pertains as little to an ephemerid as to an odonate or to a protophasmid, but is, however, a dictyoneurid-like form with very close, irregular intercalary veins.

Family HYPERMEGETHIDÆ, new family.

As type of this new family, I take an American form of Palæodictyoptera, the gigantic wing of which, even though only half is preserved, still shows a series of positive characters, which depart sufficiently from the previously mentioned families and disclose important differences in the entire organization of the animal.

Costa marginal, costal area broad, radius simple, radial sector issuing from near the base, immediately after widely branched. Media and cubitus likewise forked near the base, and all crowded into the anterior half of the wing. Anal area not marked off, large, with 3 forked anal veins widely removed from one another and extending in long flat curves to the inner border. The narrow areas between the veins are bridged over by irregular cross veins; the wider ones are filled up with a quite irregular wide-meshed network.

HYPERMEGETHES, new genus.

Costal border almost straight, subcosta approaching close to the radius, so that the costal area attains a considerable width. Radius straight and probably not branched. Radial sector arising in about the first fourth of the length of the wing, and shortly after its origin immediately divided into a narrow fork. Media close to the radius and separated into a long, narrow fork just before the origin of the radial sector. Very near the base of the wing the cubitus is divided into two branches, which continue almost parallel and close to the media to the middle of the wing without further division. Half the width of the wing is taken up by the three widely separated anal veins, the offshoots of which are forked and branch off backward. The costal area and the entire space below the cubital vein are very irregularly and coarsely reticulate, while the spaces between the other veins are bridged over by isolated cross veins.

HYPERMEGETHES SCHUCHERTI, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

The basal half, 60 mm. long, of a wing about 120 mm. in length.

Daniels collection. Reverse of holotype in the U. S. National Museum: Cat. No. 35575.

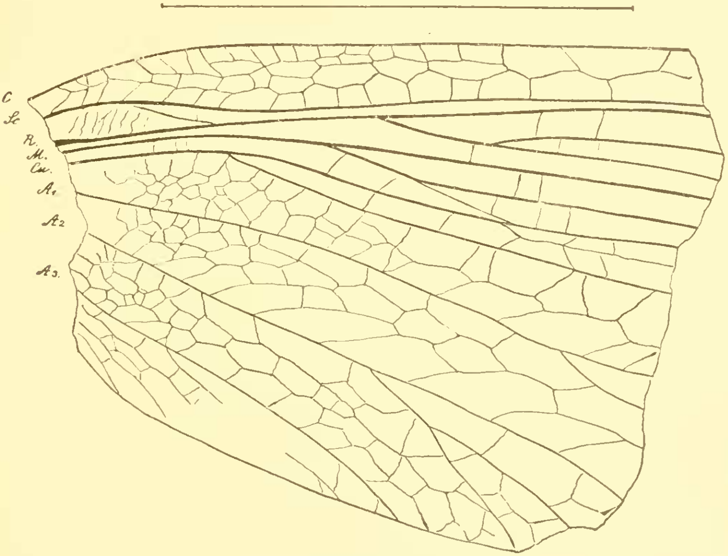


Fig. 2.—Hypermegethes schucherti.

Family LITHOMANTIDÆ, new family.

In many respects, this group is closely allied to the Dictyoneuridæ, but differs in the less frequent cross veins pertaining to the intercalary venation, which are only occasionally reticulate. The branching of the principal veins is scarcely more abundant than in the Dictyoneuridæ, and as in that group we here find the familiar isolated anterior branch of the media and of the cubitus, the marginal costa, and the simple radius, whose sector sends off several divided branches backward. Also, the veins of the anal and cubital groups extending in gentle curves to the outer margin are here present as in the Dictyoneuridæ. I would unite these groups were it not that in some known species, the form of the body differs strikingly from that of the dictyoneurids. In any event, however, the two groups are closely related.

The family Lithomantidæ, the type of which is *Lithomantis carbonaria* Woodward, includes a number of beautiful forms from the middle and upper parts of the Upper Carboniferous of Europe, to which I now add two American species.

EURYTÆNIA, new genus.

Of this form there is, unfortunately, only a large portion of the middle of the wing preserved. The anterior margin is rather strongly curved, the inner margin, on the contrary, is almost straight, so that one can infer a longer wing of nearly equal width. Costa, subcosta, and radius are separated by broad interspaces, and run nearly parallel, as does also the radial sector, which originates immediately back of the base of the wing, but which first widely branches in the apical half. The media extends in a long curve to the inner border and sends off its anterior branch far above the center of the wing. In contrast to most related forms, this branch dichotomizes. The inferior branch of the media divides into a number of branchlets, which are repeatedly bent. The long superior branch of the cubitus remains undivided, and forms a very long curve, while the lower branch of the cubitus separates into three veinlets, which like the anal veins extend in a flat curve to the outer margin. All interspaces are bridged over by numerous straight and close, mostly obliquely arranged cross veins.

EURYTÆNIA VIRGINIANA, new species.

Locality.—Gibson Fork of Fifteen-mile Creek, above Decota, West Virginia, "60 feet above coal locality called 'Keystone.'" Upper Pottsville; Lower Kanawha series.

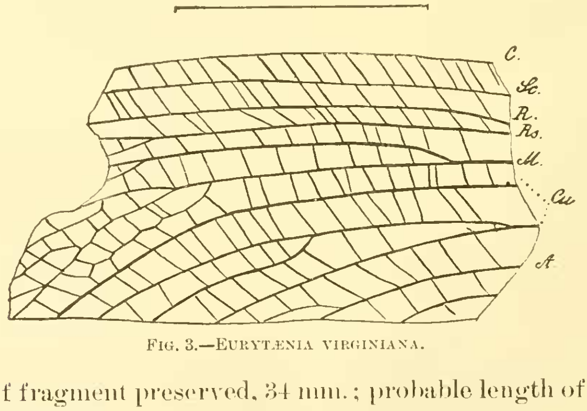


FIG. 3.—EURYTÆNIA VIRGINIANA.

Length of fragment preserved, 34 mm.; probable length of the entire wing, 55 to 60 mm.

Holotype.—Cat. No. 25631, U.S.N.M.

EURYTHMOPTERYX, new genus.

In its wing veins this form exhibits great conformity to the slender winged dictyoneurids, but differs in the delicate and rather regular, straight, and nowhere intersecting cross veins. The wing is long and narrow, almost four times as long as broad, with nearly straight costal margin and gently arcuate posterior border. The subcosta extends about two-thirds the length of the wing and proceeds obliquely to the costa. The radius runs nearly parallel with the subcosta and later with the costa, remains simple, and bends somewhat backward before the end. The radial sector arises directly below the base, but first divides in two-thirds the length of the wing into 2 branches, the superior of which forms 3 and the inferior 2 twigs. The long media sends out its isolated anterior branch above the first third of the length of the wing, and then separates in about the middle of the wing into a superior dichotomous and one inferior 3-parted branches. The undivided isolated superior branch of the cubitus issues immediately back of the base and stretches in a gently S-shaped curve to the posterior border, while the lower branch of this vein sends out backward successively 1 forked and 2 simple offshoots. The anal veins extend in curves to the outer margin.

EURYTHMOPTERYX ANTIQUA, new species.

Locality.—Pratt mines, near Birmingham, Alabama. Middle Pottsville; Pratt group; ? Sewell stage.

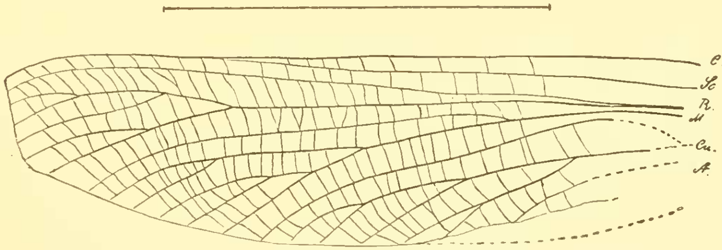


Fig. 4.—Eurythmopteryx antiqua.

Length of the wing, 50 mm. Very well preserved.

Holotype.—Cat. No. 38707, U.S.N.M.

Family LYCOCERCIDÆ, new family.

According to my view, Brongniart described as *Lithomantis goldenbergi* two specifically different forms, which in the increased branching of the principal veins are sufficiently distinguished from *Lithomantis* and the other lithomantids. On the other hand, the intercalary venation is preserved, at least in part, as a close network, and recalls that of the dictyoneurids, with which, however, the forms named in the structure of their bodies do not agree. For this reason I have placed these two French forms in a new genus *Lycocercus*, which is to be regarded as the type of a distinct family.

In all probability one of Scudder's renowned "Devonian insects" may also belong in this group.

PLATEPHEMERA Scudder.

PLATEPHEMERA ANTIQUA Scudder.

——— ——— Scudder, Devon. Insects, N. B., 1865, p. 1.

Platephemera antiqua Scudder, Canad. Nat., n. s., III, 1867, p. 205, fig. 2; Anniv. Mem. Boston Soc., 1880, p. 7, pl. I, figs. 9, 10.

Platephemera antiqua Hagen, Bull. Mus. Comp. Zool., VIII, 1881, p. 276.

Palephemera antiqua Scudder, Mem. Boston Soc., III, 1885, p. 323.

Locality.—St. John, New Brunswick. Little River group: = ? Pottsville.

Scudder sought to demonstate that this wing could only belong to an ephemerid-like insect; but Hagen strenuously opposed this view, emphatically declaring the fossil to be an odonate of the family Gomphidæ. On the other hand, Eaton conceded a measure of accuracy to Scudder's opinion, yet Brauer thought that comparison could also be made with the wings of certain mantids, blattids, and locustids, but finally expressed himself in favor of Hagen's view. Brongniart again agreed with Scudder, who, however, later departed from his former opinion and raised the fossil to the type of a distinct family, which he wrongly named "Palephemeridæ," and brought into relation with the "orthopteroid" protophasmids, yet placed it in the "neuropteroid" Palæodictyoptera.

In my opinion, all the authors mentioned are wrong, and *Platephemera* belongs to the true Palæodictyoptera. Not only the direction of the main veins declares in favor of this view, but also the intercalary venation.

Family HOMOTHETIDÆ Scudder.

This family was originally founded by Scudder on a fossil insect from the Little River group, which undoubtedly belongs to the true Palæodictyoptera. Later this author placed a large number of unrelated forms in this group.

In its shape the wing recalls the forms allied to *Homoioptera* Brongniart, from the Stephanian of Commentry. The costa is marginal, the subcosta not very far removed from it, and preserved nearly to the tip. Radius vaulted like the subcosta, not branched. Radial sector issuing near the base of the wing, with 3 or 4 oblique branches directed backward. Media probably divided near the base into 2 large, doubly forked branches, which are arched as they extend backward. To all appearance the cubitus had an isolated, long, simple superior branch and a forked inferior branch, both arcuate and directed backward. Anal veins also curved and stretching posteriorly. Anal area neither defined nor ample. Cross veins probably simple and straight, irregularly distributed, and not reticulate.

HOMOTHETUS Scudder.

HOMOTHETUS FOSSILIS Scudder.

——— ——— Scudder, Devon. Insects, N. B., 1865, p. 1.

Homothetus fossilis Scudder, Canad. Nat. (2), III, 1867, p. 205, pl. iii; Anniv. Mem. Boston Soc., 1880, p. 17, pl. i, figs. 1, 2.

Homothetus fossilis Hagen, Bull. Mus. Comp. Zool., VIII, 1881, p. 278.

Locality.—St. John. New Brunswick. Little River group; = ? Pottsville.

According to Scudder, the Homothetidæ unite the genuine neuropteres with the pseudoneuropteres, an assumption for which the present fossil, however, offers very little support. Hagen and Brauer considered *Homothetus* a sialid; Brongniart, on the contrary, an ephemerid. Personally I have no doubt that this form also belongs to the true Palæodictyoptera.

Family HEOLIDÆ, new family.

I here class an American form, which in the structure of the wing differs sufficiently from the European homoiopterids, so that the existence of essential differences in the structure of the body can be also inferred.

In form the wing is more elongated and pointed, with gently arcuate costal border and uniformly rounded inner margin. The anal portion is not broadened. The branches of the radial sector advance far out to the apex, and those of the cubitus as well as of the anal veins continue in gentle curves to the posterior margin. The cross veins are delicate, widely separated, and occasionally branched.

HEOLUS, new genus.

Wing pointed, its costal margin slightly curved and its inner border strongly and uniformly arched, about three times as long as broad. Costal area running out to a point and moderately wide. The subcosta attains three-fourths the length of the wing and fuses in the costa. Radius simple, reaching to the apex and not far removed from the subcosta. The radial sector originates in about one-third the length of the wing and diverges widely from the radius; its first branch arises quite a distance back of the center of the wing, and is divided into 4 twigs; the 4 following simple branches are parallel with each other and directed obliquely backward. The superior branch of the media issues somewhat above the middle of the wing and forms a large curve with a small terminal fork. The inferior branch separates into 2 or (?) 3 veinlets; then follows a strongly vaulted vein, which in its last third divides into 2 wide forks, and issues either from the entire cubitus or only from its superior branch. Further on there is then seen a similarly curved vein with a short, broad terminal fork: this may pertain to the inferior branch of the cubitus or to the first anal vein. Beyond this still another vein is visible, which runs off in a nearly horizontal curve to the inner border, and forms a small forked end after it had sent off a larger branch obliquely backward and outward: finally, a simple arcuate vein may be seen. Both the latter are anal veins. To all appearance about 5 to 6 anal veins may have been present. The wide interspaces between the branches of the medial, cubital, and anal veins are very striking; all the intervals are bridged over by delicate, somewhat undulating, and occasionally branched cross veins running in an oblique direction.

HEOLUS PROVIDENTIÆ, new species.

Locality.—East Providence, Rhode Island. Pennsylvanian; Allegheny or Conemaugh stage.

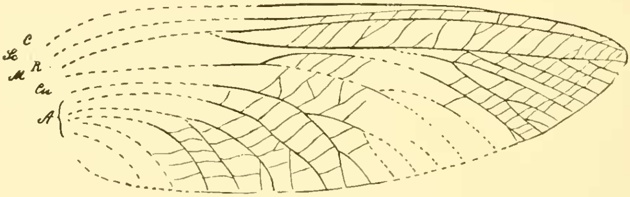


Fig. 5.—Heolus providentiæ.

Length of the well-preserved fragment, 40 mm.; probable length of the entire wing, 50 mm.

Holotype.—Cat. No. 38700, U.S.N.M.

Family POLYCREAGRIDÆ, new family.

I establish this family on a beautiful, large palæodictyopteran wing from North America, which in respect to the structure and copious branching of the principal veins recalls the spilapterids of Europe; in the form of the anal area, on the contrary, it appears more like *Lamproptilia*, and in the furcation of the medial and cubital veins calls the dictyoneurids to mind.

POLYCREAGRA, new genus.

Wing broadest at the base and of subtriangular form, fully three times as long as wide, with distinctly curved anterior margin. Costa marginal. Subcosta attaining two-thirds the length of the wing and then uniting with the costa. Radius simple, reaching to the tip, separated from the subcosta and from the radial sector by a uniformly wide interspace; the latter vein originates near the base, and in the apical half of the wing sends off one 5-parted and farther out 7 simple or forked branches, which extend obliquely backward. The simple anterior branch of the media, continuing in a long curve to the inner margin, arises above the first third of the length of the wing, while the lower branch furcates many times, so that 15 twigs reach the margin. The superior branch of the cubitus emerges near the base and forms a long curve with a dichotomous end; the posterior branch, on the other hand, separates into 5 branchlets. The group of anal veins consists of 8 to 9 compound branches, which advance more obliquely than in curves to the inner border, and thus present a nearly fanlike appearance. Plaiting, however, was not present. The numerous very delicate curved cross veins are undulating or branched, not reticulate.

POLYCREAGRA ELEGANS, new species.

Locality.—Cranston, Rhode Island. Pennsylvanian; near base of section; stage unknown.

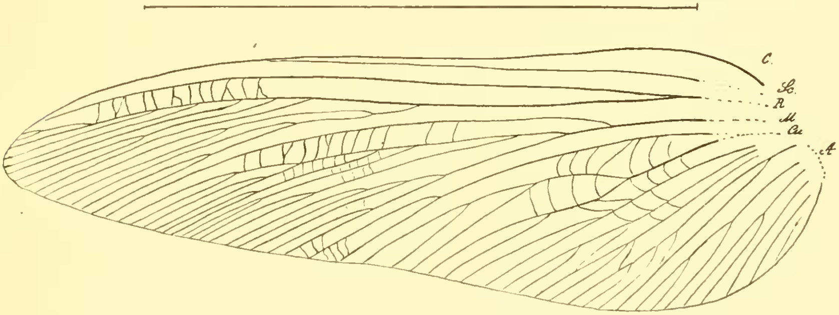


FIG. 6.—POLYCREAGRA ELEGANS.

This finely preserved wing has a length of 75 mm.

Holotype.—Cat. Nos. 38705, 38706, U.S.N.M.

Family EUBLEPTIDÆ, new family.

This family is founded on one of the smallest palæodictyopteran forms from America, which may be distinguished by its remarkably ephemerid-like appearance. The four equal wings have a feebly branched venation, which comes very near to the hypothetical type of Comstock and Needham, mentioned above. The head is comparatively large, with large compound eyes; the body slender, with long jointed cerci.

EUBLEPTUS, new genus.

Wing subelliptical, with slightly curved anterior margin and more strongly arcuate inner border, apex rounded off, narrow costal area, and feebly developed anal area. The subcosta reaches almost to the tip of the wing and fuses in the costa. Radius straight, parallel with the subcosta. Radial sector issuing not far above the middle of the wing, twice forked, so that 4 veinlets extend to the border. The media sends out its gently curved upper branch, furnished with a dichotomous end, somewhat above the origin of the radial sector, and further divides into 3 twigs only. The superior branch of the cubitus, which arises near the base, also forms a short terminal fork, and the inferior stem likewise separates into 3 branchlets. The 3 or 4 anal veins remain simple and extend in strong curves to the inner margin. The remote and irregularly distributed straight cross veins stand perpendicular to the course of the longitudinal veins. The head with its large, arched compound eyes is nearly as broad as the thorax, which consists of 3 nearly equal, never strongly united segments, and no winglike pleurites can be discerned on the prothorax. The 10 distinct abdominal segments are individually broader than long, and very similar to each other. Below the tenth ring follows a short segment, on which the basal portion of the many jointed probably very long cerci are preserved.

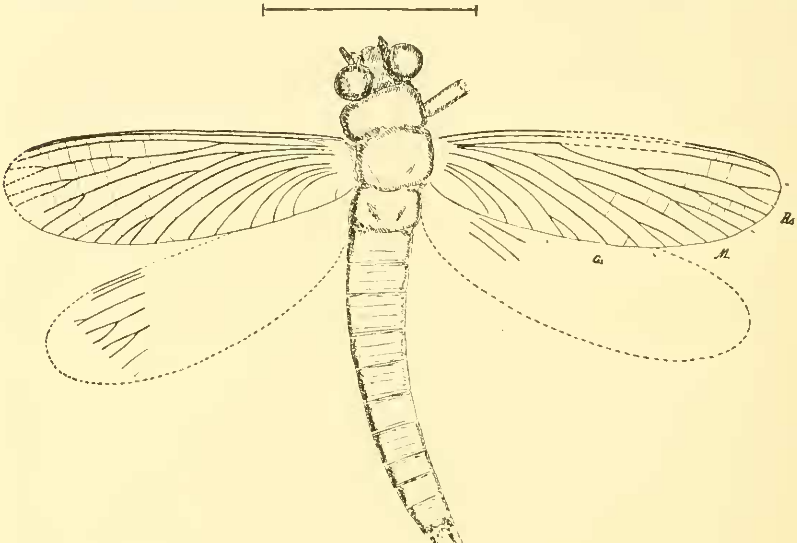


FIG. 7.—EUBLEPTUS DANIELSI.

EUBLEPTUS DANIELSI, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Length of the wings 13 to 14 mm. This fossil pertains to the smallest insect that has yet been found in the Carboniferous.

Daniels collection. Reverse of holotype in the U. S. National Museum; Cat. No. 35576.

Family METROPATORIDÆ, new family.

I regard a small palaeodictyopteran wing from the lower part of the Upper Carboniferous as the type of this family; this is one of the oldest insects yet discovered.

The shape of the wing is subelliptical, with broadly rounded tip. The costal area is not preserved, but judging from the form of the wing may have been rather wide. The subcosta reaches nearly to the tip of the wing. Radius simple. Radial sector arising near the base and dividing into 6 veinlets. Media with a long, forked superior branch and a 3-parted lower branch. Cubitus consisting of slightly arcuate offshoots extending to the posterior border. Judging from the shape of the wing, the anal portion (not preserved) certainly was not ample. Intercalary venation indistinct, consisting of a few irregular cross veins interspersed with delicate little folds.

METROPATOR, new genus.

Wing delicately membranous. Radial sector divided into 3 forks, which are all directed to the apical border. The upper branch of the media forms a short fork and extends obliquely to the end of the inner border. All the following veins stretch obliquely to the posterior margin, and I am not quite certain whether my interpretation of these is correct, because the basal portion of the wing, in which their point of union lies, is wanting. Below the superior branch of the media follows a 3-branched fork, in which the inferior medial branch may be sought; then follows a vein with a very short terminal fork, then a simple one, and lastly a 3-branched vein. These probably all belong to the cubitus, but possibly the last pertains to the anal group.

METROPATOR PUSILLUS, new species.

Locality.—Near Altamont Colliery, Anthracite region, Pennsylvania. Lower Pottsville; Lower Lykens group.

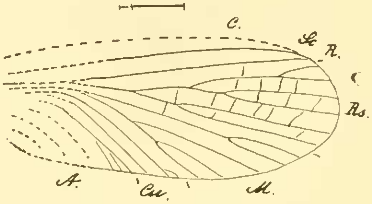


FIG. 8.—METROPATOR PUSILLUS.

Length of the part of the wing preserved, 7 mm.; probable length of the wing, 9 mm.

Holotype.—Cat. No. 35382, U.S.N.M.

Family PAOLIIDÆ, new family.

In this family I place two of Scudder's species of *Paolia*. Notwithstanding that some features in these forms point to the beginning of a higher specialization, as the spreading out and copious branching of the cubital and anal veins along the inner margin, still I believe that they should best be placed, at least for the present, in the Palæodictyoptera. Probably they are rather closely allied to the spilapterids.

PAOLIA Smith.

PAOLIA VETUSTA Smith.

Paolia vetusta SMITH, Amer. Jour. Sci. (3), I, 1871, p. 44, text fig.
Paolia vetusta SCUDDER, Zittel's Handbuch, I, 1885, p. 758, fig. 942.

Locality.—Braxton Quarry, near French Lick, Indiana. Middle Pottsville; Mansfield formation; Quinnimont? stage.

Scudder referred this form to the protophasmids; Brongniart, on the contrary, to the protolocustids, which, in my opinion, is quite wrong.

PAOLIA GURLEYI Scudder.

Paolia gurleyi SCUDDER, Proc. Amer. Acad., XX, 1885, p. 173.
Paolia gurleyi MELANDER, Jour. Geol., XI, 1903, p. 185, pl. VII, fig. 7.

Locality.—Near French Lick, Orange County, Indiana. Middle Pottsville; Mansfield formation; Quinnimont? stage.

Paolia lacoana Scudder and *P. superba* Scudder belong, in my opinion, in another group.

Family ÆNIGMATODIDÆ, new family.

I here place a new palæodictyopteran form from the middle of the Upper Carboniferous of North America, which does not differ essentially from all other forms of this group.

The wing is strongly arched and apparently of firmer texture, broadly rounded at the apex. The anal area is not enlarged.

ÆNIGMATODES, new genus.

The subcosta reaches nearly to the apex of the wing. Radius simple; radial sector divided into 3 members. Media separating into 4 branches. Below the media follows an oblique vein directed to the inferior margin and terminating in a short fork; then 3 simple veins, whose strongly curved ends merge into the lower border. The last 2 of these veins probably belong to the anal group. The intercalary venation consists in part of regular stout cross veins and in part of a polygonal network.

ÆNIGMATODES DANIELSI, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

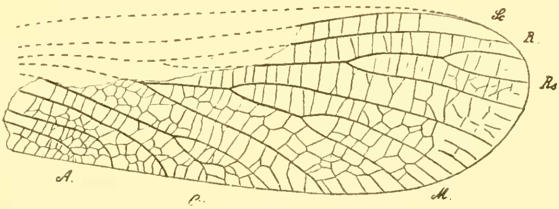


FIG. 9.—ÆNIGMATODES DANIELSI.

Length of the preserved fragment, 18 mm.; probable length of the entire wing, 20 mm.

Daniels collection. Reverse of holotype in the U. S. National Museum; Cat. No. 35578.

PALÆODICTYOPTERA INCERTÆ SEDIS.

The following forms are too imperfectly preserved for accurate description, but most probably they all belong in the order Palæodictyoptera.

LITHENTOMUM Scudder

LITHENTOMUM HARTTII Scudder.

——— ——— SCUDDER, Devon. Insects, N. B., 1865, p. 1.
Lithentomum harttii SCUDDER, Canad. Nat. (2), III, 1867, p. 206, pl. IV; Anniv. Mem. Boston Soc., 1880, p 22, pl. I, fig. 3.

Locality.—St. John. New Brunswick. Little River group: = ?Pottsville.

In this small frament of a wing Scudder discovered "relationship" to the ephemerids, embids, and raphidids, and supposed it to be closely allied to the sialids; it was, therefore, to be regarded as the progenitor of this group. On this ground, also, the family "Chronicosialidæ" was erected. Hagen supposed the fragment to belong to a true sialid; Brauer, however, again found similarity to orthopteres and homopteres. Finally Scudder placed the fossil in the "hemeristines," a group of his "neuropteroid Palæodictyoptera," which, however, as we shall see, contained the most heterogeneous elements.

DYSCRITUS Scudder.

DYSCRITUS VETUSTUS Scudder.

——— ——— SCUDDER, Devon. Insects, N. B., 1865, p. 1.
Dyscritus vetustus SCUDDER, Geol. Mag., V, 1868, pp. 172, 176; Anniv. Mem. Boston Soc., 1880, p. 20, pl. I, fig. 4.

Locality.—St. John, New Brunswick. Little River group: = ? Pottsville.

A small fragment, which neither Scudder nor any other author has been able to classify.

XENONEURA Scudder.

XENONEURA ANTIQUORUM Scudder.

——— ——— SCUDDER, Devon. Insects, N. B., 1865, p. 1.
Xenoneura antiquorum SCUDDER, Canad. Nat., n. s., III, 1867, p. 206, fig. 5; Anniv. Mem. Boston Soc., 1880, p. 24, pl. I, figs. 5–7.

Locality.—St. John, New Brunswick. Little River group: = ? Pottsville.

This small, poorly preserved remnant of an insect gave rise to the erection of risky hypotheses and called forth a vigorous controversy among authors. A wrinkled place near the base of the wing was interpreted by Scudder as an organ of stridulation, and led to the establishment of a distinct family, "Xenoneuridæ," which combined the characters of the locustids with those of the neuropteres. Darwin, Dawson, and Packard then made use of this fossil as a "striking" example of a synthetical type and of the earliest appearance of organs of stridulation. Later, Scudder himself was obliged to confess that the structure described as a stridulating organ had nothing whatever to do with the wing. Instead, however, in the sparingly veined, little remnant, he now found indications of a relationship with the ephemerids, sialids, raphidids, and coniopterids. A close examination of the fossil by Hagen gave no positive result, yet it was determined by him that the venation recognized by Scudder pertained in part to a second underlying wing. From Hagen's statements I have sought to correct Scudder's figure, and I have thus succeeded in a plan of neuration which allows the specimen to be referred to the Palæodictyoptera. A more accurate classification, however, appears to me for the time being excluded, and could be obtained only after a second careful examination of the original.

PSEUDOHOMOTHETUS, new genus.

PSEUDOHOMOTHETUS ERUTUS (Matthew.)

Homothetus erutus MATTHEW, Trans. Roy. Soc. Canada, IV, 1894, p. 95, pl. 1, fig. 11.

Locality.—St. John, New Brunswick. Little River group: = ? Pottsville.

I have no doubt that this wing belongs to the Palæodictyoptera, but certainly not to the genus *Homothetus*, with which it has only very slight similarity; I therefore propose a new generic name.

CAMPTERONEURA, new genus.

CAMPTERONEURA RETICULATA, new species.

Locality.—Cordova, Alabama. Middle (?) Pottsville: Mary Lee group; ? Upper Quinnimont stage.

A portion 47 mm. long, from the anal part of a large wing, which permits the recognition of 8 successive veins, nearly all furcate, and strongly curving to the inner margin; these correspond to the anal group and (? the first 2) probably to a part of the cubitus. Between the veins is found a thin, irregular and wide-meshed network. The characteristic curvature of the principal veins excludes every doubt as to the palæodictyopteran nature of this fossil, to the exact classification of which, however, further data are wanting.

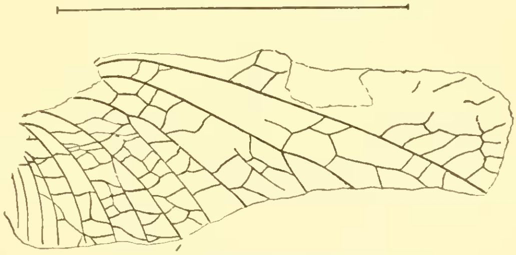


FIG. 10.—CAMPTERONEURA RETICULATA.

Holotype.—Cat. No. 38709, U.S.N.M.

ORTHOGONOPHORA, new genus.

ORTHOGONOPHORA DISTINCTA, new species.

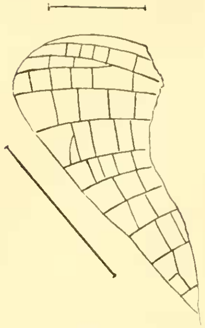


FIG. 11.—ORTHOGONOPHORA DISTINCTA.

Locality.—Drews Creek, West Virginia. Coal Measures.

A small piece of a medium-sized wing, permitting the recognition of the end only of the simple radius, a portion of the radial sector with its last short branch, and the ends of 8 other almost parallel veins curving toward the inner margin; the latter certainly belong to the radial sector and to the media. All these veins are united by conspicuous, straight, vertical cross veins.

This fossil, also, most probably belongs to the Palæodictyoptera, but is too imperfectly preserved to be more accurately determined.

Holotype.—Cat. No. 25632, U.S.N.M.

BATHYTAPTUS, new genus.

BATHYTAPTUS FALCIPENNIS, new species.

Locality.—Coalburg, near Birmingham, Alabama. Upper Pottsville; Pratt group; probably Sewell stage.

The tip of a larger wing, whose sinuate lower border and straight costal margin somewhat recall *Breyeria.* The subcosta is preserved nearly to the tip of the wing and fuses in the costa. The radius is simple and runs parallel with the subcosta. The radial sector, which is separated from the radius by a wide area, sends out its partly dichotomous, partly simple branches, obliquely backward. Delicate, somewhat undulating, and occasionally branched cross veins unite the longitudinal veins, but form no network.

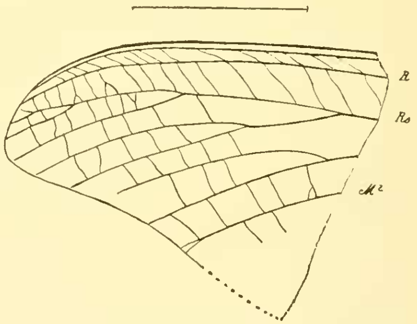


FIG. 12.—BATHYTAPTUS FALCIPENNIS.

In some points this fossil recalls the European breyeriids, but for the present can not be placed with certainty in any family. Doubtless, however, it belongs to the Palæodictyoptera.

Holotype.—Cat. No. 38708, U.S.N.M.

PALAIOTAPTUS, new genus.

PALAIOTAPTUS MAZONUS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

The tip of a wing. Anterior margin gently curved, lower margin not sinuate. Subcosta near to the costa and continuing almost to the tip. Radius simple, radial sector with oblique, simple, or compound veins extending backward and separated from the radius by a broad space. The intercalary venation consists of a wide-meshed network, like that in the dictyoneurids.

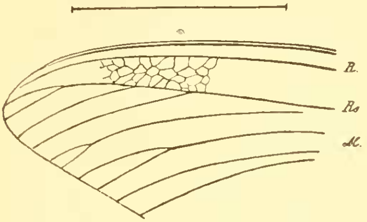


Fig. 13.—Palaiotaptus mazonus.

Holotype.—Cat. No. 38815, U.S.N.M.

PSEUDOPAOLIA, new genus.

PSEUDOPAOLIA LACOANA (Scudder).

Paolia lacoana Scudder, Proc. Amer. Acad., XX, 1885, p. 173.

Locality.—Pittston, Pennsylvania. Pennsylvanian.

In any event this species does not belong in the genus *Paolia* Scudder, but most probably likewise to the Palæodictyoptera.

Holotype.—Cat. No. 38100, U.S.N.M.

PARAPAOLIA, new genus.

PARAPAOLIA SUPERBA (Scudder).

Paolia superba Scudder, Proc. Amer. Acad., XX, 1885, p. 173.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

This palæodictyopteran form also certainly belongs in a distinctly different genus from *Paolia* Scudder and *Pseudopaolia* Handlirsch.

LARVAL PALÆODICTYOPTERA.

(PALÆODICTYOPTERON) MAZONUM, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

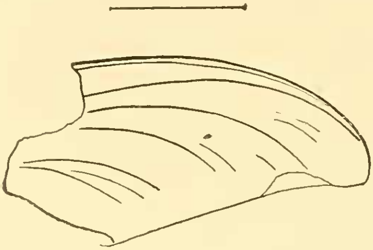


FIG. 14.—(PALÆODICTYOPTERON) MAZONUM.

A portion of a wing pad of cambered and stoutly pointed form; 18 mm. in length.

Holotype.—Cat. No. 38831, U.S.N.M.

(PALÆODICTYOPTERON) LATIPENNE, new species.

Locality.—Braidwood, Illinois. Pennsylvanian; Conemaugh ? stage.

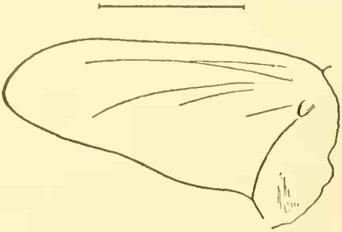


FIG. 15.—(PALÆODICTYOPTERON) LATIPENNE.

A wing pad 22 mm. long, with gently curved anterior margin, broadly rounded tip, and broader base.

Holotype.—Cat. No. 38838, U.S.N.M.

(PALÆODICTYOPTERON) VIRGINIANUM, new species.

Locality.—McGinnis's mine, near Redbird, West Virginia. (Raleigh ? Pottsville ?).

Probably 400 feet above the Hampton conglomerate. Soft coal. Raleigh sheet. Collector, B. F. Phillips.

A portion of the thorax with the wing pads and some remnants of the abdominal segments. The well-preserved pad of the hind wing shows a strongly arched upper margin and an almost straight posterior border. It has a length of about 12 mm.

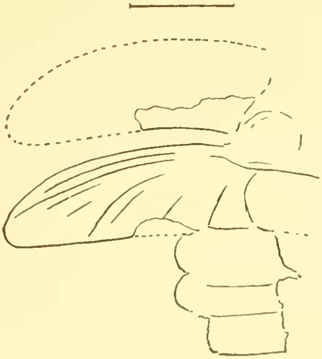


FIG. 16.—(PALÆODICTYOPTERON) VIRGINIANUM.

Holotype.—Cat. No. 25635, U.S.N.M.

Order PROTODONATA (Brongniart) Handlirsch.

Generally large insects, whose slender body very quickly recalls that of the odonates. The four equal wings are independent of each other and movable only in a vertical direction; at rest, horizontally outspread. The neuration of the wing is more highly specialized by the coalescence of several longitudinal veins in the basal portion of the wing, by the conversion of longitudinal veins into the so-called accessory sectors, and by the regular arrangement of cross veins. Intersection of the longitudinal veins, pterostigma, "wing triangles," as well as the reduction of the anal veins, which are quite generally present in the odonates, are still entirely wanting in the present group. The head is large, with large eyes, and powerful mandibles; the thorax is constructed like that in the odonates, with much reduced tergites of the meso- and metathorax, on account of which the wing bases appear to be nearer together. The legs are strong, similar in form, and of normal length; the antennæ short. Unfortunately, in no specimen has the end of the abdomen yet been found, so that at present nothing can be said as to the nature of the appendages.

There is indeed no doubt that this group constitutes a connecting link between the palæodictyopteres and the odonates, combining the characters of the two orders.

The protodonates embrace the largest fossil insects yet discovered (length of wing over 300 mm.), and are found principally in the younger beds of the Carboniferous of Europe and America.

PARALOGUS Scudder.

PARALOGUS ÆSCHNOIDES Scudder.

Paralogus æschnoides Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 21, pl. I, figs. a, b.

Paralogus æschnoides Brongniart, Faune ent. terr. prim., 1893, p. 521, fig.

Locality.—Silver Spring, East Providence, Rhode Island. Pennsylvanian; ten-mile series; Allegheny or Conemaugh stage.

A well-preserved wing of 60 mm. length.

PALÆOTHERATES, new genus.

PALÆOTHERATES PENNSYLVANICUS, new species.

Locality.—Campbells Ledge, near Pittston, Pennsylvania. Near top of Pottsville; upper transition group.

A fragment of a wing, 45 mm. long. Probable length of wing, 100 mm. One can distinguish numerous longitudinal veins, partly simple, partly compound in the form of accessory sectors, which are united by straight cross veins, as in the odonates, so that rectangular or polygonal cells result. In my opinion, the first conspicuous marginal vein in the specimen may correspond to the costa, and indeed to that part which lies outside the point of union with the subcosta. The second vein visible may then be the radius, and the 2 following branched veins should belong to the radial sector, the 3 succeeding this to the media, and the next to the cubitus. The accuracy of this assumed interpretation rests upon a portion only of the terminal half of a very large wing. On the other hand, should the second conspicuous vein be declared the subcosta, the interpretation would then be a much more difficult one and the resemblance to the other prodonates much lessened.

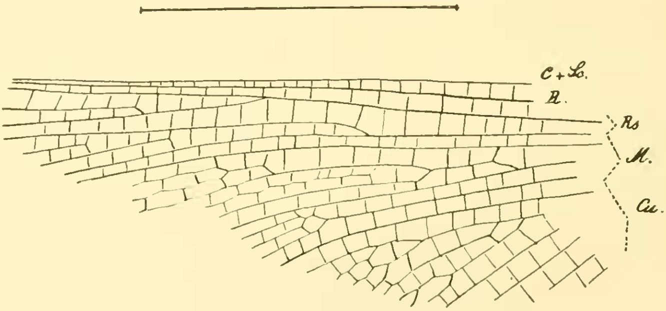


Fig. 17.—Palæotherates pennsylvanicus.

Holotype.—Cat. No. 38787, U.S.N.M.

Order MEGASECOPTERA (Brongniart) Handlirsch.

In this order I place a series of more highly developed forms, which are derived directly from the Palæodictyoptera. These forms are especially distinguished by the fact that a tendency to degeneration appears, namely, a specialization of the anal part of the wing, as well as a reduction in the number of cross veins, the regular arrangement of these, and the partial coalescence of the media and cubitus with the base of the radius. A further important character to be noted is the differentiation of the thoracic segments by the diminution of the prothorax. In agreement with the Palæodictyoptera we here also find 4 equal, horizontal, outspread wings, independent of one another, rather uniform segmentation of the abdomen, and very well-developed cerci.

I believe that it will not appear too hazardous if I express the opinion that the megasecopteres are a lateral branch of the palæodictyopteres, from which the insects of the panorpatean series have later developed. Various features support this opinion, as, for instance, the cordate head of many Megasecoptera, the independently moving wings diminished at the base, the approaching cerci of many forms, the reduction of the cross veins, etc.

The megasecoptera are represented by numerous forms in the middle and upper parts of the Upper Carboniferous of Europe. The first two species were discovered in America.

RHAPHIDIOPSIS Scudder.

RHAPHIDIOPSIS DIVERSIPENNA Scudder.

Rhaphidiopsis diversipenna SCUDDER, Bull. U. S. Geol. Surv., No. 101, 1893, p. 11, pl. I, figs. c. d.

Locality.—Cranston, Rhode Island. Pennsylvanian; near base of section; stage?

This fossil requires further investigation.

ADIAPHTHARSIA, new genus.

ADIAPHTHARSIA FERREA, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

An entire insect with horizontally outspread wings. Length of the body (without appendages) 10.2 mm.; length of wing, 8 mm.

The abdomen is as wide at the base as the thorax, but diminishes posteriorly in a manner similar to that in many megasecopteres. The four wings are similar in form and size, their anterior border is nearly straight, the lower margin strongly arched, the anal area neither defined nor expanded. Costa, subcosta, and radius are adjacent and nearly parallel; the radial sector appears to emerge about in the middle of the wing. The media enters into union with the radial sector by means of its superior branches; likewise the cubitus with the media. The anal veins arise from one common stem, which stretches obliquely to the inner edge, so that we apparently see but one anal vein with 3 offshoots branching off posteriorly. Cross veins are developed in small numbers.

Unfortunately, there is but one specimen of this interesting form at hand, which is from the collection of Mr. Daniels. The wings are all preserved only to the middle, and their venation is, on account of occasional shifting, hard to decipher.

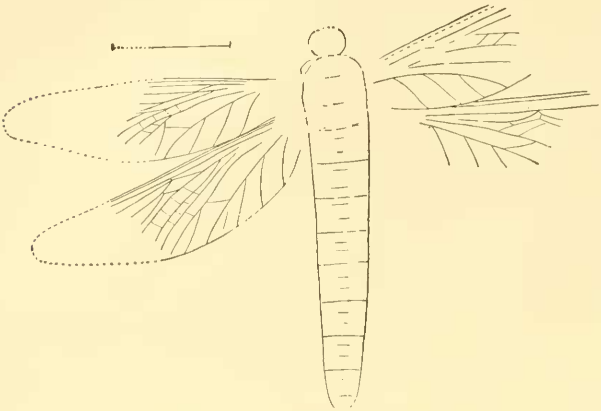


FIG. 18.—ADIAPHTHARSIA FERREA.

Order HADENTOMOIDEA, new order.

I establish this order upon a very interesting insect, which in many points still recalls the Palæodictyoptera; in other respects, however, it departs so widely from this and all other fossil groups that I regard the new order warranted.

The head is free, rather large, and apparently prognathous; it shows moderately large, lateral, compound eyes, and its form somewhat recalls the head of perlids or embids. The prothorax is remarkably elongate and wider than the head, without pleurites. Meso- and metathorax somewhat smaller than the prothorax. Abdomen rather compressed, shorter than the wings. Hind wing only slightly shorter and broader than the front wing, while the difference in their venation is scarcely worth mentioning. Costa marginal, well developed; subcosta abridged, ending immediately below the middle of the wing. Radius simple and stout, continuing to the tip. The radial sector arises near the base and is far removed from the radius; it separates into 3 branches. The media is free and forms a large fork. The likewise free cubitus extends obliquely to the inner border and sends out posteriorly 4 short, simple, or furcate branchlets. The first anal vein forms a short fork, the second is simple, and both continue in a curve to the posterior margin. The anal area is small in both pairs of wings and is not defined. The wide space between the radius and the radial sector is filled up with large polygonal cells and the remaining interspaces are bridged over by straight cross veins far removed from each other. The wings are not horizontally outspread, as in previously mentioned forms, but are laid back flat over the abdomen, yet not folded.

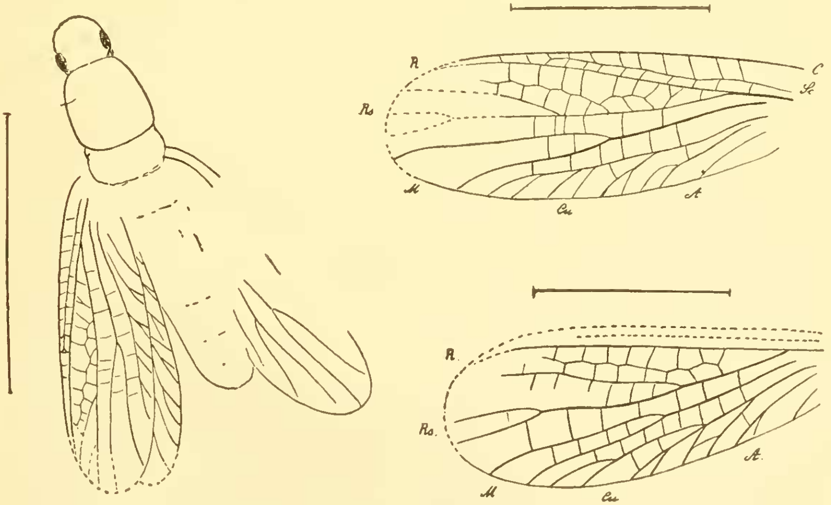
The derivation of this form from the palæodictyopteres is certainly not so difficult as the determination of its relations to the more highly developed groups, of which, in my opinion, the highest perlids and embids come into consideration. In view of the entire course of evolution, the latter of these groups seems to me to agree most closely, on account of the stronger reduction of the anal portion of the wing and of the cross veins, for it must be admitted that the progenitors of the perlids may also have already possessed a tendency to the formation of an anal fan in the hind wing; further, that the number of their longitudinal and cross veins may have been still greater. If the reduction of the cross and longitudinal veins in the wing of *Hadentomum* is imagined to have advanced only a little farther, there would result in any event an embidlike form of wing.

This explanation, however, still remains very uncertain, and it is easily possible that direct descendants of *Hadentomum* no longer exist.

HADENTOMUM, new genus.

HADENTOMUM AMERICANUM, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.



FIGS. 19, 20, 21.—HADENTOMUM AMERICANUM.

Length of front wing, 26 mm.; length of entire specimen 35 mm.

Daniels collection. Reverse of cotype in the U. S. National Museum: Cat. No. 35579.

Order HAPALOPTEROIDEA, new order.

This order is to be regarded as provisional, and, moreover, includes but one American fossil of which there is only one front wing known, and which permits itself at present to be ranked in no other order.

The neuration of this wing may be easily traced to the palæodictyopteran type, yet in the reduction of the cubitus and in the more vaulted (instead of extending in a curve to the lower margin) anal veins, it shows itself more highly specialized. A separation of the anal area has not yet been attained, and the wing appears to have been of a very tender, delicate, membranous nature. As neither the body nor the hind wing is present, I have not attempted to place this interesting fossil in one of the other Paleozoic orders, although it is always possible that it belongs in the protorthopteran group. It may be, however, that in this specimen we must seek a forerunner of the perlidæ, the venation of which can quite easily be traced in that of the present fossil. However, in any case, further discoveries must be awaited before we can here render a final decision.

HAPALOPTERA, new genus.

HAPALOPTERA GRACILIS, new species.

Locality.—Sharp Mountain Gap, near Tremont, Pennsylvania. Anthracite series; stage undetermined.

Length of wing, 15 mm. The greatest width amounts to scarcely one-third the length and lies somewhat below the middle of the wing. The tip is rounded off obliquely; the costal border is so slightly curved as to be almost straight; the costal area is narrow. The subcosta fuses with the radius just above the tip of the wing. Radius simple, not far removed from the subcosta. Radial sector originating near the base of the wing, with 3 simple branches extending obliquely to the apical border. Media independent, not uniting with the radius; it first sends off an oblique branch to the inner margin and then forms a large long fork, whose branches continue obliquely to the lower end of the apical border. The cubitus is restricted to a single long fork, below which 2 distinctly vaulted, simple anal veins are then to be seen. Midway through the medial group stretches a furrow, but the limits of the anal area are not fixed. The cross veins are not very distinct, but appear to have been rather regularly distributed. The wing joins the thorax with a broad base.

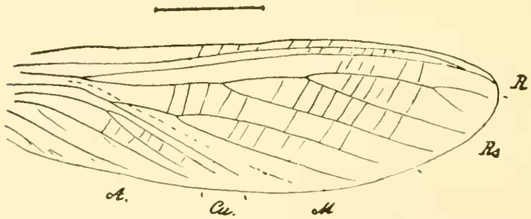


FIG. 22.—HAPALOPTERA GRACILIS.

Holotype.—Cat. No. 38731, U.S.N.M.

Order MIXOTERMITOIDEA, new order.

This order is likewise a provisional one, and includes only two forms, *Mixotermes luganensis* Sterzel, from Saxony, and *Geroneura wilsoni* Matthew, from St. John, New Brunswick, the placing of which in other orders has seemed to me hazardous.

The wings of these forms are distinguished by a broadly rounded apical border, and in respect to their neuration they very closely approach the palæodictyopteran type. The few branches of the media, the cubitus, and the anal veins extend obliquely to the lower margin. The anal area is feebly developed, and its limits are not fixed; the subcosta is reduced, the radius simple, and its sector feebly branched. Cross veins straight and numerous.

There will probably be no doubt cast on the direct derivation of these forms from the palæodictyopteres. Whether, however, they must be brought into nearer relations to the protorthopteres or to the perlids, I have not been able for the present to decide.

GERONEURA Matthew.

GERONEURA WILSONI Matthew.

Geroneura wilsoni Matthew, Trans. Roy. Soc. Canada, IV, 1889, p. 57, pl. iv, fig. 10.

Locality.—St. John, New Brunswick. Little River group; =? Pottsville age.

Order PROTORTHOPTERA Handlirsch.

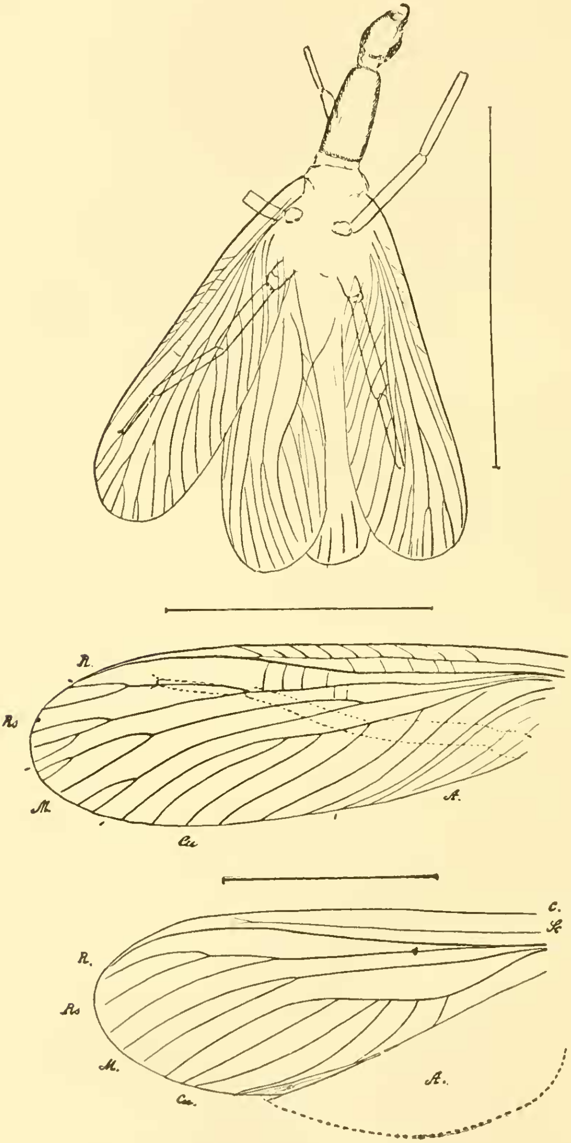
This order embraces a series of Paleozoic forms, which are distinguished by more highly specialized wings and, according to my view, constitute a transition from the palæodictyopteres to the orthopteres (*s. str.*). The wings of these forms are folded over the abdomen when at rest; the front wings no longer have the simple venation which we have seen in the Palæodictyoptera, and their veins no longer extend in regular curves to the inner margin. The hind wings are rather similar to the front ones, yet possess an enlarged anal area marked off by a fold. When the wings are at rest, this area is doubled under. The body is more or less strongly built; the prothorax large, often much elongated; the head large with strong mouth parts fitted for chewing, and with long slender antennæ. The legs are either similar in form and fitted for running, or the hind ones are transformed into legs for jumping. Stridulatory organs not yet present.

Family SPANIODERIDÆ, new family.

In this family I place a number of American forms with greatly elongated prothorax and strongly vaulted cubital vein, whose oblique branches are directed backward. These forms have as yet no legs for jumping.

SPANIODERA, new genus.

Front wing with apical border broadly rounded, slightly curved marginal costa, and abridged subcosta. Radius simple, reaching nearly to the tip of the wing. Radial sector issuing near the base, furcate below the middle, and each branch again divided. About in the middle of the wing, the media separates into 2 forked branches. The



Figs. 23, 24, 25.—Spaniodera ambulans.

cubitus is long, continued in a gently S-shaped curve, and sends out 5 simple offshoots obliquely backward. The few anal veins are gently arcuate. Hind wing with a large anal area, limited by a straight fold, radial sector 3-branched and media simply furcate; its cubital vein is more strongly arcuate and the branches extend in part to the apical margin, in part to the anal furrow. Cross veins not very distinct, oblique in the costal area, elsewhere more perpendicularly arranged.

The prothorax is long and narrow, the head rather large and seemingly prognathous, with moderately developed compound eyes. Middle and hind legs appear far removed from one another and are long and stout.

SPANIODERA AMBULANS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Length of the entire insect, 48 mm. Length of the front wing, 35 mm.

Holotype.—Cat. No. 38817, U.S.N.M..

GYROPHLEBIA, new genus.

Very similar to *Spaniodera*. Costa nearly straight. Subcosta continued farther toward the tip of the wing. Radius simple. Radial sector originating near the base, with 3 branches directed backward. Media (?) not forked. Cubitus arcuate, with 4 branches extending obliquely to the inner margin. Anal veins similar to those in *Spaniodera*.

Prothorax long; head somewhat prognathous, antennæ long and slender; front legs shorter; middle and hind legs longer, all only in part preserved and therefore not to be described in detail.

GYROPHLEBIA LONGICOLLIS, new species.

"Near *Cheliphlebia*" SCUDDER, Mem. Boston Soc., III, 1885, p. 329, pl. XXX, fig. 7.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

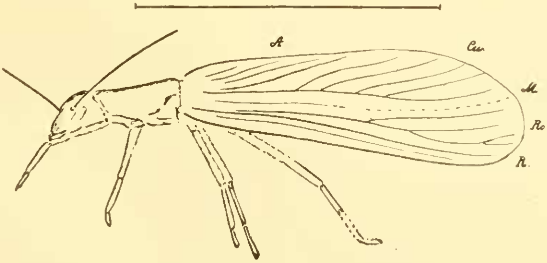


FIG. 26.—GYROPHLEBIA LONGICOLLIS.

Length of the entire insect, 40 mm.

Scudder has placed this fossil in the homothetids and rightly recognized its affinity with *Chelipphlebia*. He, however, regarded the homothetids as neuropteroid forms.

Holotype.—Cat. No. 38150, U.S.N.M.

MIAMIA Dana.

MIAMIA BRONSONI Dana.

Miamia bronsoni Dana, Amer. Jour. Sci. (2) XXXVII, 1864, p. 34, fig. 1.
Miamia bronsoni Scudder, Mem. Boston Soc., I, 1866, p. 190, pl. vi, figs. 2, 4.
Miamia bronsoni Brongniart, Bull. Soc. Rouen (3), XXI, 1885, p. 62.

Locality.—Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

On this fossil Scudder founded the "neuropteran" group Palæopterina, which he brought into relation with the termitids. Gerstäcker considered the fossil a perlid; Brongniart, a "neurorthopteron" of the family "Hadrobrachypoda;" Brauer, on the other hand, found more affinity with the orthopteres.

PROPTETICUS Scudder.

PROPTETICUS INFERNUS Scudder.

Propteticus infernus Scudder, Mem. Boston Soc., III, 1885, p. 334, pl. xxxi, figs. 3, 4.

Locality.—Little Vermilion River, Vermilion County, Illinois. Pennsylvanian; Allegheny ? stage.

Scudder placed this form also in the neuropteroid series, in the Palæopterina. Brauer stated that its systematic position was undetermined, but found relationship with the sialids.

CAMPTOPHLEBIA, new genus.

CAMPTOPHLEBIA CLARINERVIS (Melander).

Dictyoneura clarinervis Melander, Jour. Geol., XI, 1903, p. 185, pl. vi, fig. 1; pl. vii, fig. 8.

Locality.—Danville, Illinois. Pennsylvanian; Conemaugh (or Freeport ?) stage.

Melander wrongly referred this form to the dictyoneurs, which he regarded as a protophasmid. I am therefore forced to propose a new generic name for the fossil.

METACHELIPHLEBIA, new genus.

METACHELIPHLEBIA ELONGATA (Scudder).

Cheliphlebia elongata Scudder, Mem. Boston Soc., III, 1885, p. 328, pl. xxix, fig. 7.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

This form was likewise referred by Scudder to the "neuropteroid" homothetids. In my opinion, the insect belongs to the protorthopteres, and in a genus other than *Cheliphlebia carbonaria* Scudder; wherefore, I propose a new generic name.

PARACHELIPHLEBIA, new genus.

PARACHELIPHLEBIA EXTENSA (Melander).

Cheliphlebia extensa MELANDER, Jour. Geol., XI, 1903, p. 186, pl. VI, fig. 2; pl. VII, fig. 9.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

This appears to me to be also generically different from *Cheliphlebia carbonaria*.

PETROMARTUS Melander.

PETROMARTUS INSIGNIS Melander.

Petromartus insignis MELANDER, Jour. Geol., XI, 1903, p. 192, pl. VI, fig. 6; pl. IX, figs. 12, 13.

Locality.—Petty's Ford, Little Vermilion River (Danville), Illinois. Pennsylvanian; Allegheny ? stage.

Melander referred this form to the homothetids.

DIECONEURA Scudder.

DIECONEURA ARCUATA Scudder.

Dieconeura arcuata SCUDDER, Mem. Boston Soc., III, 1885, p. 336, pl. XXX, fig. 4.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Scudder placed this fossil with the Palæopterina, a family of his neuropteroid Palæodictyoptera.

Holotype.—Cat. No. 38146, U.S.N.M.

DIECONEURITES, new genus.

DIECONEURITES RIGIDUS (Scudder).

Dieconeura rigida SCUDDER, Mem. Boston Soc., III, 1885, p. 336, pl. XXIX, fig. 10.

Locality.—Campbells Ledge, Pittston, Pennsylvania. Near top of Pottsville; upper transition group.

A poorly preserved fossil, which, however, still makes it possible to discern that it belongs in a different genus from *Dieconeura arcuata* Scudder. Scudder referred the form to the Palæopterina.

Holotype.—Cat. No. 38156, U.S.N.M.

METRYIA, new genus.

Front wing of a form similar to that in *Dieconeura*, but somewhat less slender. The marginal costa not vaulted. Subcosta reduced. Radius simple, reaching to the tip. Sector issuing near the base and divided into 2 dichotomous branches below the middle of the wing. Media probably simple. Cubitus apparently forming a large curve, from which one simple offshoot, then 2 forked ones, and finally one more simple, short branch run off successively backward. Anal area with 2 compound and 1 simple veins. Cross veins preserved only on the costal border.

METRYIA ANALIS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

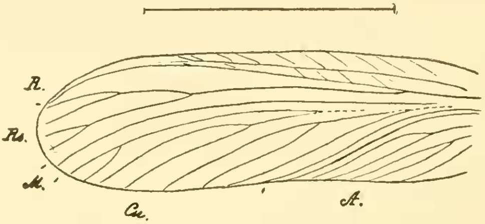


Fig. 27.—Metryia analis.

This large wing, 34 mm. long, most probably belongs to a spanioderid form, although the cubitus appears to be somewhat differently constructed than in the other genera of the group.

Holotype.—Cat. No. 38834, U.S.N.M.

Family ŒDISCHIDÆ, new family.

A number of the protorthopteres are characterized by the fact that the superior branch of the media of the front wing coalesces with the radial sector, and later again furcates to continue on apparently as an offshoot of the latter vein. In one of the previously discovered forms of this group, the hind legs are preserved and are developed as legs for jumping (as in locustids).

This group is represented in Europe and America.

GENENTOMUM Scudder.

GENENTOMUM VALIDUM Scudder.

Genentomum validum Scudder, Mem. Boston Soc., III, 1885, p. 329, pl. xxx, figs. 2, 3.

Œdischia valida Brongniart, Faune ent. terr. prim., 1893, p. 559.

Locality.—Mazon Creek, near Morris, Illinois; Pennsylvanian; Kittanning? (Allegheny) stage.

Scudder took the hind wings for the front ones, and referred the form to the homothetids (Palæodictyoptera Neuropteroidea); Brauer found affinity with the sialids, and only Brongniart recognized the relationship with the orthopteres in a strict sense.

Holotype.—Cat. No. 38135, U.S.N.M.

PROGENENTOMUM, new genus.

Closely allied to the genus *Genentomum.* The front wing is somewhat more pointed, its anterior margin slightly arched; subcosta reduced; radius simple, its sector emerging far above the middle, with 4 in part furcate anterior branches. Media with (?) 5 nearly parallel principal offshoots, the first of which comes in contact with the radial sector at one point. Cubital and anal parts not preserved. Cross veins almost straight, rather regular and numerous, but not very strongly imprinted.

PROGENENTOMUM CARBONIS, new species.

Locality.—Mazon Creek, near Morris, Illinois; Pennsylvanian; Kittanning ? (Allegheny) stage.

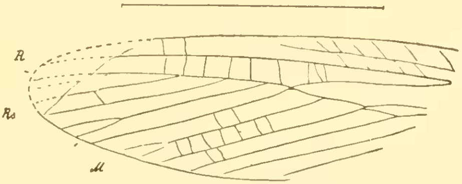


Fig. 28.—Progenentomum carbonis.

A piece, 35 mm. long, of a wing whose length was about 50 mm. Daniels collection. Reverse of holotype in the U. S. National Museum: Cat. No. 35580.

Family GERARIDÆ, new family.

In this family I place a series of larger American forms, which in the main are not sufficiently well preserved to be accurately described, yet permit it to be clearly seen that they belong to the protorthopteres. The bodies of these insects are not well preserved, nevertheless they appear to have been rather slender and the prothorax seems compressed, with margins, borders, or processes perhaps similar to those which we find in many recent Orthoptera. Unfortunately, in all the fossils of this group at hand the front and hind wings lie over one another—that is, are folded over the abdomen, so that the deciphering of the neuration is attended with considerable difficulty.

It is possible that this family may coincide with the œdischiids when better preserved examples become known.

GERARUS Scudder.

Wings with slightly arcuate anterior border, marginal costa, broadly rounded end, and abridged subcosta. Radius simple. Radial sector issuing near the base, with numerous in part divided branches. Media (at least in the hind wing) free; cubitus with several offshoots branching out backward.

Anal area of the hind wing fanlike, enlarged, and plaited.

GERARUS VETUS Scudder.

Gerarus vetus Scudder, Mem. Boston Soc., III, 1885, p. 344, pl. xxxi, fig. 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Scudder placed this form in the group "Gerarina," of his neuropteroid Palæodictyoptera.

Holotype.—Cat. No. 38136, U.S.N.M.

GERARUS LONGUS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittaning ? (Allegheny) stage.

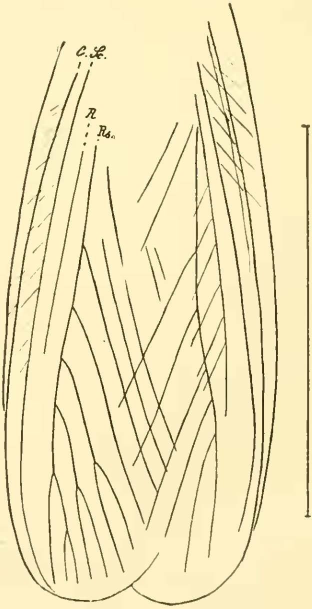


Fig. 29.—Gerarus longus.

Length in similar wings, 50 mm.; more slender than the preceding species.

Holotype.—Cat. No. 38822, U.S.N.M.

GERARUS DANIELSI, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Obverse and reverse of a magnificently preserved example, in which, however, the wings again unfortunately lie over one another. With the exception of the anterior margin, the front wing has only mere traces left, so that the venation of the hind wing, at least, can be more clearly made out.

The accompanying figure shows on the right side the well-defined marginal costa, then the subcosta ending in the costa above the apex, the simple radius, the radial sector arising near the basal attachment of the wing, and having 5 simple or (on the left) compound branches, then the many-times branched media, and finally the cubitus, with its abridged offshoots continuing downward toward the anal furrow. In the evidently plaited anal fan, a number of straight veins are to be seen diverging radially. Cross veins appear to have been abundantly developed, but are not sharply defined. The abdomen was shorter than the wings, and moderately stout; the prothorax large, almost saddle-shaped, and not broader than long, rugose and always furnished with 2 spinelike processes on the sides. A longer process lying in front of the prothorax may pertain to a part of the head.

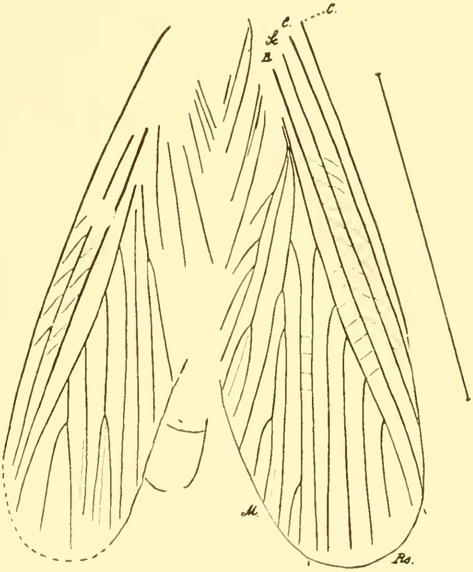


FIG. 30.—GERARUS DANIELSI.

Daniels collection. Plastotype and reverse of holotype in the U. S. National Museum: Cat. Nos. 25928, 35574.

GERARUS MAZONUS Scudder.

Gerarus mazonus SCUDDER, Mem. Boston Soc., III, 1885, p. 344, pl. XXXII, fig. 7.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

GERARUS ANGUSTUS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

This species was longer and more slender than the foregoing, and may have had a length of wing of about 65 mm., of which 53 mm. are preserved.

Holotype.—Cat. No. 38811, U.S.N.M.

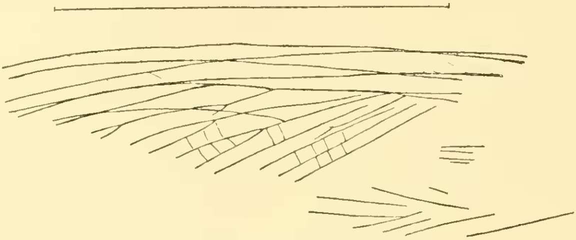


FIG. 31.—GERARUS ANGUSTUS.

GENOPTERYX Scudder.

By this generic name Scudder designated a fossil which in any event is most nearly related to *Gerarus*.

GENOPTERYX CONSTRICTA Scudder.

Genopteryx constricta SCUDDER, Mem. Boston Soc., III, 1885, p. 327, pl. XXIX, fig. 11.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittaning? (Allegheny) stage.

Scudder referred this form not to the Geraridæ, but to the homothetids.

Holotype.—Cat. No. 38148, U.S.N.M.

GERAROIDES, new genus.

By this name I distinguish a form which has been recently published by Melander and erroneously placed in the genus *Dieconeura* Scudder.

GERAROIDES MAXIMUS (Melander).

Dieconeura maxima MELANDER, Jour. Geol., XI, 1903, p. 193, pl. VI, fig. 5; pl. VII, figs. 14–17.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Melander referred this fossil to the Palæopterina, one of the "neuropteroid" palæodictyopteran groups.

Order PROTOBLATTOIDEA, new order.

The forms which I include in this order appear to stand in the same relation to the recent blattæforms as do the protorthopteres to the recent orthopteroids—that is, they seem to form a connecting link between the Palæodictyoptera and the blattæforms. The great similarity existing between many protorthopteres and protoblattoides clearly indicates, therefore, that the two groups were derived from nearly related Palæodictyoptera.

The protoblattoids are characterized by a distinct, rounded head, by a prothorax either not expanded or only moderately so, and by wings which stand about midway between the blattoids and the palæodictyopteran type. When at rest the wings are laid back over the abdomen. The front wings have an anal area fairly well defined and filled up with arcuate or oblique veins descending to the posterior margin; the hind wings, on the other hand, have an enlarged, fold-bearing anal area. The body is not very slender, but still is more so than in the majority of blattoids.

Family ORYCTOBLATTINIDÆ, new family.

This family embraces a series of forms that have been referred by authors partly to the blattids and partly to the homopteres (Fulgoridæ). These forms are distinguished by a well-defined anal area, with a variously large number of more or less oblique or arcuate longitudinal veins; further, by a strongly compound radial sector, a less copiously divided media, and by a large number of delicate veins running out obliquely from the cubitus. The costal area is broad and filled up with numerous veins issuing from the subcosta. From the radius also such veins extend forward. Intercalary venation abundantly developed, often forming accessory sectors between the principal veins. Legs stout, homonomous. Antennæ long and many jointed. Thorax stout, with the pronotum not much expanded.

Very similar wings are still found to-day among the mantoids; for example, in *Metalleutica.*

ORYCTOBLATTINA Scudder.

Media free from the base on, not united with the radial sector.

ORYCTOBLATTINA LAQUEATA Scudder.

Oryctoblattina laqueata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 133, pl. XI, fig. 6.

Locality.—170 feet above the base of the Upper Barren Coal Measures, near Kansas City, Missouri. Chanute shales; Conemaugh ? stage.

Scudder regarded this form as one of the Palæoblattariæ.

Holotype.—Cat. No. 38160, U.S.N.M.

ORYCTOBLATTINA AMERICANA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

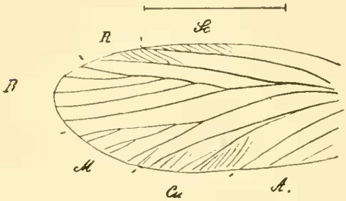


FIG. 32.—ORYCTOBLATTINA AMERICANA.

A front wing of 19 mm. length. Similar to *Oryctoblattina laqueata* Scudder. Radial sector with 4 nearly parallel branches extending in an almost straight course to the apical margin. Media free and independent, divided below the middle of the wing into 3 forked branches. Cubitus consisting of 2 long stems, which send out numerous oblique offshoots to the inner margin. Subcosta and radius with similar branchlets directed to the anterior border. Anal area rather small, with few slightly curved veins. Intercalary venation unfortunately not well preserved.

Holotype.—Cat. No. 38647, U.S.N.M.

ORYCTOBLATTINA LATIPENNIS, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

A fragment 11 mm. long, from the base of a long, proportionally broad wing about 18 mm. in length. The space above the subcosta is filled up with oblique veins, and the wide space between the subcosta and the radius by rather regular cross veins. Radial sector with only a few distant branches. Media free, first furcating below the middle. Cubitus dichotomous, with many oblique veinlets stretching backward.

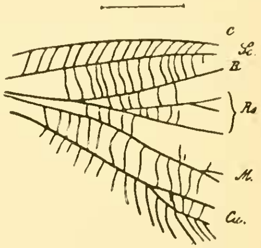


FIG. 33.—ORYCTOBLATTINA LATIPENNIS.

All interspaces are filled up with straight or undulating cross-veins.

Holotype.—Cat. No. 38656, U.S.N.M.

BLATTINOPSIS Giebel.

Germar's *Blattina reticulata* is to be regarded as the type of this genus. Above the origin of the radial sector, there spring forth proximally from the radius from 1 to 2 longitudinal veins, which most probably belong to the media.

BLATTINOPSIS ANTHRACINA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Length of the front wing about 17 mm. Costal border strongly arcuate. Costal area broad. Subcosta does not extend far beyond the middle of the wing. Radius continued far toward the apex. Radial sector with 6 nearly parallel branches, the third of which divides into 3 twigs. Above the radial sector only 1 straight branch issues from the radius. Media, however, twice forked. Cubitus furcate, with numerous veinlets extending to the margin. Anal area limited by an arcuate fold, with several nearly straight longitudinal veins. Cross veins in the costal area oblique, as well as in the distal portion of the space above the radius; but in the basal part of the wing they are straighter. Between the branches of the radial sector and the media, as well as in the postcubital area and below the radius, are polygonal cells. In the smaller areas, these cells are arranged in two rows, so that their connecting veins become almost like accessory sectors, as in other species.

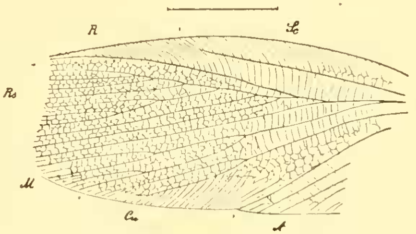


Fig. 34.—Blattinopsis anthracina.

Holotype.—Cat. No. 38629, U.S.N.M.

GLAPHYROPHLEBIA, new genus.

In this genus the number of veins is much more reduced than in those preceding. The media is free and forms a simple fork; the radial sector has 5 simple branches, and the cubitus sends out a series of inclined branchlets which are directed backward without presenting a typical forking. Anal area small, with few veins, and marked off by a nearly straight fold. Intercalary veins well developed. Cross veins not very close; in the larger areas united in a net-like manner.

GLAPHYROPHLEBIA PUSILLA, new species.

Locality.—From a coal mine 150 feet deep, at Braceville, Grundy County, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

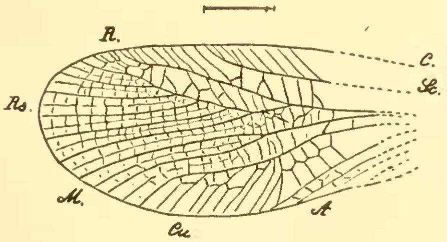


Fig. 35.—Glaphyrophlebia pusilla.

Length of the front wing, 10 mm. Anterior margin moderately curved, apex very broadly rounded. Costal area broad. Subcosta reaching not far beyond the middle of the wing. Radial sector emerging above the middle of the wing and sending out successively to the apical border 5 simple branches, which diverge in a fanlike manner. Media free, divided into a large fork about in the middle of the wing. Cubitus vaulted, not furcate, sending out backward about 5 branches with accessory sectors lying between them. Anal area small, defined anteriorly by a nearly straight fold. Costal area with oblique cross veins. The remaining broad areas have a wide-meshed network; the small ones have cross and intercalary veins. From the distal end of the radius oblique veins stretch to the anterior margin.

Daniels collection.

MICROBLATTINA Scudder.

Subcosta reduced. Radius with a number of branches directed to the costal margin. Radial sector with about 6 offshoots branching off backward. Media with 2 furcate branches. Cubitus with several oblique veinlets extending backward. Of intercalary and cross-veins there is nothing to be seen.

MICROBLATTINA PERDITA Scudder.

Microblattina perdita SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1898, p. 57, pl. III, fig. 5.

Locality.—East Providence, Rhode Island. Pennsylvanian: Tenmile series; Allegheny or Conemaugh stage.

Referred by Scudder to the Palæoblattariæ.

Holotype.—Cat. No. 38098, U.S.N.M.

Family ÆTHOPHLEBIDÆ, new family.

In this family, which I regard as a provisional one, I place a form whose relations to the oryctoblattids can hardly be misunderstood.

The costal area is broad. The subcosta sends out numerous oblique veins to the slightly curved costal margin. The radial sector issues from the radius not far above the middle of the wing and sends out several (3 or 4) branches to the apical border. The media separates into 1 superior furcate, and 1 inferior copiously-branched offshoot. The cubitus sends out 4 or 5 oblique branches to the inner border. Anal area long and narrow, marked off by a gently-curved vein. The larger interspaces are bridged over by cross veins far removed from each other.

ÆTHOPHLEBIA Scudder.

ÆTHOPHLEBIA SINGULARIS Scudder.

Æthophlebia singularis SCUDDER, Mem. Boston Soc., III, 1885, p. 338, pl. XXXI, fig. 9.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Length of wing, 33 mm.

Scudder referred this fossil to the Palæopterina, a group of neuropteroid palæodictyopteres. According to my view, it can scarcely be doubted that the specimen pertains to a form of the blattoid series.

Holotype.—Cat. No. 38147, U.S.N.M.

Family CHELIPHLEBIDÆ, new family.

This is likewise a provisional group, established for the reception of a North American fossil, the systematic position of which still appears not quite clear, although many features indicate that it belongs in the blattæform series.

The wings are folded over the abdomen. The front wings have a distinctly curved anterior margin, a broad costal area, which is filled up with irregular, oblique, and intersecting veins. The radius runs out parallel with and close to the subcosta, and above the middle of the wing sends off a sector divided into 3 to 4 branches. Media free, with a furcate superior branch and a many-times divided inferior offshoot. Cubitus free, with a number of branches stretching toward the inner margin. Anal area small, defined by an arched vein. Cross veins irregular, occasionally reticulate.

CHELIPHLEBIA Scudder.

CHELIPHLEBIA CARBONARIA Scudder.

Cheliphlebia carbonaria Scudder, Mem. Boston Soc., III, 1885, p. 328, pl. xxx, fig. 8.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Length of wing, about 40 mm.

Scudder also considered this fossil a "neuropteroid" insect of the group of homothetids. In my opinion, however, this insect can not belong to the Palæodictyoptera, but only to the orthopteroids or to the blattæforms. The reduction of the subcosta and the bow-shaped furrow of the anal area point to the latter group.

Holotype.—Cat. No. 38149, U.S.N.M.

Family EUCÆNIDÆ, new family.

In this family I unite a series of American forms of well-marked blattid-like habit, with broad, nearly elliptical front wings, shieldlike, enlarged, oblong prothorax, and robust body. In some examples, an ovipositor is to be seen. Middle and hind legs are short, their femora stout; the front legs, on the contrary, are longer, and were evidently fitted for the seizing of prey. At the end of the abdomen are 2 rather short cerci. The neuration is characterized by a very broad costal area, which attains about two-thirds the length of the wing, by a reduction of the radius to few branches, and by the expansion of the cubital area. The anal area is reduced and is marked off by a curved suture. When at rest, the firmly chitinized, arched front wings were folded over the abdomen.

EUCÆNUS Scudder.

EUCÆNUS OVALIS Scudder.

Eucænus ovalis Scudder, Mem. Boston Soc., III, 1885, p. 325, pl. xxix, fig. 4.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Two of these specimens show a distinct ovipositor.

Scudder regarded this insect, also, as a neuropteroid form and placed it in the homothetids.

Holotype.—Cat. Nos. 38142, 38810, 38820, U.S.N.M.

EUCÆNUS MAZONUS Melander.

Eucænus mazonus Melander, Jour. Geol., XI, 1903, p. 188, pl. vi, fig. 3; pl. vii, fig. 10.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

EUCÆNUS ATTENUATUS Melander.

Eucænus attenuatus Melander, Jour. Geol., XI, 1903, p. 188, pl. vi, fig. 4; pl. vii, fig. 11.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

The U. S. National Museum possesses one example (No. 38828), which without doubt belongs to this species. This specimen shows us that the part which Melander took for a head pertains to the prothorax. A second poorly preserved example (No. 38827) exhibits distinctly preserved gonapophyses, which stand out in the form of a short ovipositor.

EUCÆNUS ROTUNDATUS, new species.

"*Neuropteroid. Fam. Homothetidæ*" Scudder, Mem. Boston Soc., III, 1885, pl. xxix, fig. 9.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

A front wing of about 32 mm. in length and 15 mm. in breadth. The costal area attains scarcely two-thirds the length of the wing and is very broad. The radius first divides below the middle of the wing and forms but a few branches, as does the media. More than half the breadth of the wing is filled up by the numerous offshoots of the cubitus, which are mainly furcate.

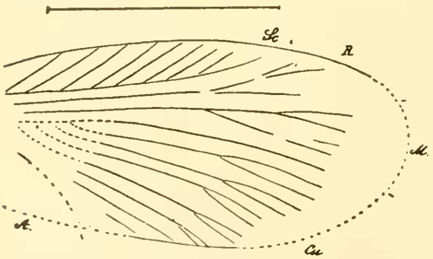


Fig. 36.—Eucænus rotundatus.

Holotype.—The original bears the Cat. No. 38153, U.S.N.M., and the label "cf. *Acridiites priscus* Andree."

Family GERAPOMPIDÆ, new family.

The forms of this group are rather closely allied to the eucænids; yet the costal area of the front wing appears more reduced and is supplanted by a great number of branches extending forward from the radius. Here, also, the radius and media are crowded back by the strongly developed cubitus. The anal area is marked off by a curved fold. Prothorax elongated.

GERAPOMPUS Scudder.

GERAPOMPUS BLATTINOIDES Scudder.

Gerapompus blattinoides SCUDDER, Mem. Boston Soc., III, 1885, p. 326, pl. XXIX, fig. 1.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Scudder regarded this form, which is to be considered the type of the genus, as a homothetid (neuropteroid Palæodictyoptera).

GERAPOMPUS EXTENSUS Scudder.

Gerapompus extensus SCUDDER, Mem. Boston Soc., III, 1885, p. 326, pl. XXIX, figs. 5, 8.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Holotype.—Cat. No. 38141, U.S.N.M.

GERAPOMPUS SCHUCHERTI, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Length of the front wing, 27 mm.; breadth, 11 mm.

The form of the wing is almost elliptical, with strongly arcuate anterior border and broadly rounded outer margin. The subcosta extends not far beyond the middle of the wing and sends off 7 in part simple, in part compound veins to the anterior margin. The costal area is more band shaped and narrower than in *Eucænus*. The radius proceeds in an almost straight course to the anterior border and sends off about a dozen oblique twigs directed forward; the sector arises in about the middle of the wing and forms a single fork. The media separates into 3

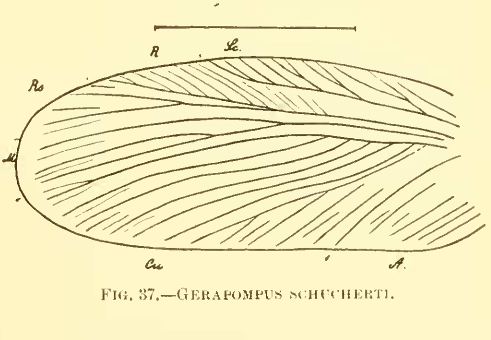


FIG. 37.—GERAPOMPUS SCHUCHERTI.

branches, and the strongly developed cubitus gives off about 8 in part compound offshoots obliquely backward. The anal area is defined by an arcuate fold, and contains numerous veins continuing to the posterior border. Between many of the principal branches accessory veins are to be noted.

Holotype.—Cat. No. 38816, U.S.N.M.

Family ADIPHLEBIDÆ, new family.

In this family I place two forms with highly specialized wings and enlarged, shield-shaped prothorax. The habit of these forms is decidedly blattid like, but the venation departs so widely from that of all known Paleozoic blattids that it can be hardly possible for its derivation to be traced from a blattid wing. The branches of the radius, the media, and the cubitus, as well as those of the subcosta, run off almost ray like from the base of the wing, and are separated by numerous intercalary veins; the interspaces are bridged over by many cross veins.

In my opinion, we may be dealing with a highly aberrant side branch of the Protoblattoidea, which probably again disappears in the Paleozoic.

ADIPHLEBIA Scudder.

ADIPHLEBIA LACOANA Scudder.

Adiphlebia lacoana SCUDDER, Mem. Boston Soc., III, 1885, p. 345, pl. XXXII, fig. 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38143, U.S.N.M.

ADIPHLEBIA LONGITUDINALIS (Scudder).

Termes longitudinalis SCUDDER, Mem. Boston Soc., III, 1885, p. 350.
Goldenbergia longitudinalis BRONGNIART, Bull. Soc. Rouen (3), XXI, 1885, p. 61.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

This form may possibly coincide with *Adiphlebia lacoana.* The original distinctly shows the form of the thorax and the wings folded over one another, the neuration of which appears to have great similarity with that of the foregoing species.

Later, Scudder himself recognized that this fossil was not a termite.

Holotype.—Cat. No. 38140, U.S.N.M.

FAMILY ANTHRACOTHREMMIDÆ, new family.

I establish this family on one of the remarkable insects described by Scudder, the wings of which essentially differ from those of all other Carboniferous insects hitherto known; its chief relations are nevertheless still with the blattæform series. The body of this insect is robust, constructed similar to that in *Eucænus* and *Adiphlebia;* the prothorax is enlarged disk shaped. The front legs, like those in *Eucænus*, appear to have been somewhat elongated. The front wings are slender, 4 times as long as wide, and have a strongly arcuate anterior border, a very narrow costal area extending about two-thirds the length of the wing, and a short anal area which is marked off by a bow-shaped fold. The radius is simple, and reaches nearly to the tip of the wing. The radial sector emerges very near the base of the wing, and sends off 4 or 5 simple branches extending in a curve to the apical border. The offshoots of the media and of the cubitus are hard to separate, are nearly parallel, and are oriented toward the apical border. The neuration of the hind wing is similar to that of the front wing, yet the subcosta proceeds much farther toward the tip. The anal area is, unfortunately, not to be made out, but was evidently plaited.

Like the foregoing form this appears to be a highly aberrant side branch of the Protoblattoidea.

ANTHRACOTHREMMA Scudder.

ANTHRACOTHREMMA ROBUSTA Scudder.

Anthracothremma robusta SCUDDER, Mem. Boston Soc., III, 1885, p. 327, pl. xxx, figs. 1, 5, 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38139, U.S.N.M.

PROTOBLATTOIDEA INCERTÆ SEDIS.

MEGALOMETER, new genus.

MEGALOMETER LATA, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allgeheny) stage.

The impression of an entire insect, with broad, elliptical wings folded over the abdomen, proportionally narrow abdomen, and small, kidney-shaped prothoracic shield. In habit this form resembles *Eucænus*, yet the prothorax as well as the venation appear to be different.

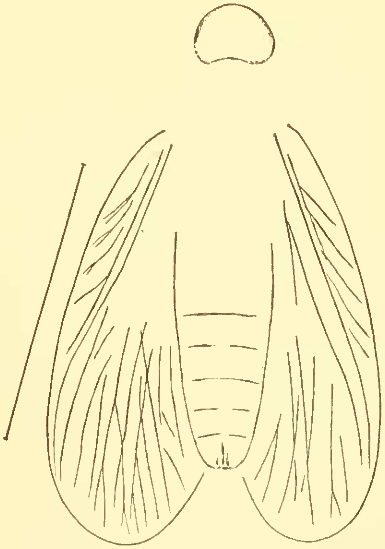


FIG. 38.—MEGALOMETER LATA.

The length of the entire impression amounts to about 37 mm.; the length of the front wing is about 30 mm.

A wide costal area can be distinguished, which takes up about two-thirds the length of the wing. The subcosta is like that in *Eucænus* and sends off 5 or 6 oblique branches anteriorly. Above its extremity the radius curves toward the apical margin and is simple. Its sector appears to arise about in the middle of the wing. In consequence of the overlapping of the front and hind wings, I can not decipher the remaining venation.

Holotype.—Cat. No. 38825, U.S.N.M.

PSEUDETOBLATTINA, new genus.

PSEUDETOBLATTINA RELIQUA (Scudder).

Etoblattina reliqua Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 18, pl. II, fig. g; No. 124, 1895, p. 106, pl. IX, fig. 10.

Locality.—Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

It seems to me improbable that this fossil belongs to the true blattids, since the shape of the subcosta and of the radius indicate a nearer relationship to *Eucænus*, *Gerapompus*, etc. In many respects, also, the neuration recalls the oryctoblattids.

AGOGOBLATTINA, new genus.

AGOGOBLATTINA OCCIDUA (Scudder).

Oryctoblattina occidua Scudder, Proc. Acad. Nat. Sci. Phila., 1885, p. 37; Mem. Boston Soc., IV, 1890, pl. XXXII, fig. 3.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

This form does not probably belong to the oryctoblattids, as Scudder believed, but in any case in the order Protoblattoidea. Unfortunately Scudder's drawing is not clear enough to make it possible to distinguish the veins of the overlapping wings; consequently I am not in a position to determine the systematic position more accurately.

Holotype.—Cat. No. 38103, U.S.N.M.

POLYERNUS Scudder.

POLYERNUS COMPLANATUS Scudder.

Polyernus complanatus Scudder, Mem. Boston Soc., III, 1885, p. 343, pl. XXXI, figs. 8, 11.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Obverse and reverse of an insect about 50 mm. long, with front and hind wings folded over the abdomen, and in proportion to the size of the body, with a very small, semicircular pronotum, the tuberculate middle portion of which Scudder took for an eye.

The veins are much more numerous than in most other forms of this order, but through overlapping and folding are so confused that from this example an interpretation is scarcely possible.

Scudder likewise considered this fossil a "neuropteroid" form and placed it in the gerarins.

Holotype.—Cat. No. 38144, U.S.N.M.

POLYETES, new genus.

POLYETES FURCIFER, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning? (Allegheny) stage.

Front wing, 24 mm. long, broadly elliptical, with rounded apical margin. The subcosta may have attained about two-thirds the length of the wing. The radius is simple and somewhat recurved toward the end; near the base of the wing it sends out the sector, which is divided into 5 branches. The media likewise separates near the base of the wing into 2 main branches, each of which again divides into 3 branchlets. The twigs of the inferior branch, as well as those of the cubitus, proceed to the inner margin. The anal area may have been small and permits the recognition of several veins extending to the posterior border. Cross veins irregular, occasionally recticulate. Front and hind wings had a similar neuration and were folded over the rather slender abdomen. The prothorax appears to have been of moderate size.

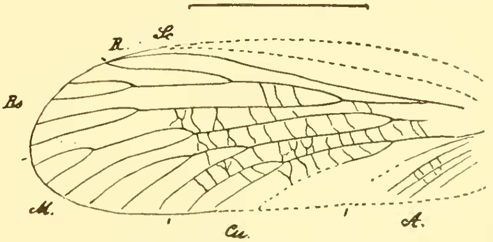


Fig. 39.—Polyetes furcifer.

I believe that this fossil may yet be brought into relation primarily with *Cheliphlebia*. Perhaps in just this form we must seek for the connecting link between the Blattæformia series and the Palæodictyoptera.

Holotype.—Cat. No. 38823, U.S.N.M.

Order BLATTOIDEA Handlirsch.

Scudder has attempted to separate, as an order, the Paleozoic blattoids from the later fossil and recent forms. In my opinion (which moreover agrees with that of several authors), such a separation, however, is not practicable, because no sharply differentiating characters exist, and those selected are in no wise valid. The fusion of the anal veins in the inner margin, on the one hand, still occurs in recent forms, as well as the independence of the principal veins from each other; and, on the other hand, among the typical Paleozoic blattoid forms there are also those in which the type of venation prevailing today is to be observed. In primordial time, the hind wings of blattoids were already straight as at present, exhibiting an anal area plaited lengthwise (contrary to the view of Sellards): there were also even then forms in which a cross folding of the wing was indicated (in the European Permian), and, as a rule, cross veins were clearly developed. In many living forms the cerci are still long and distinctly jointed. The ovipositors mentioned by Sellards could probably not hold ground in a critical investigation, and may in all probability never have existed; they have been hitherto observed only in several nymphs, which very likely belong to the protoblattoids, but as yet in no true blattoid imago, and it seems to me very hazardous to assume the existence of long ovipositors as a character of the Palæoblattariæ.[a] On the other hand, the discovery of several egg cases proves to us that the Carboniferous blattids even at that time laid their eggs in a way similar to that which their descendants still practice to-day. The young stages of Paleozoic blattoids also strikingly resemble those of recent forms, though in general it is to be noted that in individual cases the former, in their more distinctly jointed and longer cerci and in their more slender form, more nearly approach the type of palæodictyopteran larvæ. As previously mentioned, it is extremely difficult to make a sharp distinction between the protoblattoids and the blattoids, and at the present time one can hold only to the fact that the former, at least in respect to the venation of their wings, are much more closely allied to the primitive type (Palæodictyoptera) than the latter.

A systematic arrangement of Paleozoic blattoids in natural groups clearly meets with not inconsiderable difficulties, because in the course of time all series must be bound together by intermediate forms. The systematic arrangement attempted by Scudder has proved itself wholly defective in every respect, and rests upon entirely artificial, arbitrarily selected characters. Moreover, as a rule, Scudder's generic diagnoses do not at all apply to the majority of forms as arranged by him, and according to this system very closely related species must be separated in widely different genera.

I have therefore attempted to set up a new grouping, to the extent of bringing the genera and families, as far as possible, into agreement with those of recent blattoids. In so doing, I have been forced to erect a large number of new groups, in order to avoid uniting heterogeneous elements. I am fully convinced that many of my genera will be combined when more abundant material becomes known; still I consider it wiser for the present to separate them than to unite them with uncertainty.

---

[a] The ovipositors mentioned by Brongniart as occurring in several Carboniferous blattids are likewise a *lusus naturæ*, and no "prolongation of the lower genital process."

In the establishment of families I have allowed myself to be governed by chronogenesis, taking those forms which most nearly approach the protoblattoids, namely, the palæodictyopteran type, as the stem group. This group includes, among others, the genus *Archimylacris* Scudder, which, being the first described, I use in the family name "Archimylacridæ." This family embraces the large majority of Paleozoic forms, and scarcely continues into the Mesozoic; it likewise includes the *oldest* forms. All other families—and among these the mylacrids also, which were previously regarded as a stem group—are more highly specialized and may be traced back to the archimylacrid type. They appear chiefly in later strata and several of them pass over into the Mesozoic.

If, with Scudder and Sellards, we should regard the mylacrids as the most primitive blattoids, we should then be forced to go much further, and consider the blattoids the most primitive insects; then the archimylacrid wing would form the connection with the Palæodictyoptera, which, however, in all points are incomparably more primitive forms and are also proved to be decidedly older than the mylacrids and the blattoids in general.

It is not possible to derive the blattoids from more highly specialized orthopteran forms, as the locustids, etc.; and even if elongated ovipositors should actually have been present in some blattoids, which I, however, question, there would still be no ground for such an acceptation, because, as is well known, similar structures occur in the most diverse developmental series, and were also present in many Palæodictyoptera. The fact is that in those old beds in which as yet no blattoids have been discovered, no true Orthoptera have likewise been met with, but only Palæodictyoptera. In the very oldest forms, cross veins are always present. A disappearance of cross veins always indicates a higher specialization, and in the blattids is frequently associated with a stronger chitinization of the front wing.

Family ARCHIMYLACRIDÆ, new family.

This group embraces the large majority of Paleozoic blattoids, and is united with the protoblattoids, namely, the Palæodictyoptera, by transitional forms. The neuration of the Archimylacridæ mainly resembles the palæodictyopteran type, and may be regarded as the point of origin for the succeeding more highly specialized families.

The subcosta of the front wing is always preserved as an independent vein and sends off a variously large number of branches to the costal margin. These offshoots are either equally divided (pectinate) or are united in groups, but never issue in a raylike manner from one point at the base of the wing. The subcosta is never restricted to a short, strongly chitinized swelling at the base of the anterior border. The radius is more or less copiously branched, and only in the most primitive forms still shows the typical ancestral separation into radius and sector. The entire radial group is mainly divided into several clusters of twigs, or the branches all arise apparently on the superior side of the principal vein. The media is either separated into 2 main compound offshoots, or it forms one vein with branches running off backward, or, finally, one such with the branches ramifying anteriorly: All these modifications are united by transition forms.

In a majority of cases the cubitus sends out its branches sloping to the inner margin; more rarely there is one isolated, widely furcating superior offshoot. The anal area is always marked off by a bow-shaped furrow and contains a number of veins which fuse in the posterior margin.

The intercalary venation is either irregularly reticulate or it consists of very delicate regular cross veins. In the forms whose wings are more firmly chitinized, we find in place of these cross veins only a more or less irregular leathery structure, which further often exhibits distinct cross wrinkles.

In the primitive forms the body is more slender; in those more highly developed, often greatly expanded. Cerci are well developed, distinctly jointed. Legs more or less slender, often with spines. Antennæ slender.

PALÆOBLATTA, new genus.

With this name I distinguish a very primitive form, which in many respects shows great similarity to certain protoblattoids (*Eucænus*, *Gerapompus*, etc.) and which in their venation very strikingly resemble the palæodictyopteran type, so that they could be referred with almost equal right to the protoblattoids as to the blattoids.

The subcosta reaches somewhat beyond half the length of the wing and sends out about 10 branches. The radius proceeds in a nearly straight course to the tip of the wing and above the end sends off about 10 branchlets to the anterior margin. The radial sector originates in the typical manner above the middle of the wing and forms 4 twigs. The media likewise separates above the middle of the wing into 2 equally furcate branches, of which the last end in the inner margin. The cubitus sends 4 oblique branches to the inner margin. The anal area is slender and attains nearly half the length of the wing; it is defined by a gently curved vein and contains several (about 5) in part compound veins which end in the posterior border. The intercalary venation is irregular and occasionally reticulate. The costal margin is strongly curved, and the costal area wide. Wing $2\frac{2}{3}$ times as long as broad. Shield of the pronotum comparatively small, almost semicircular in form. Abdomen rather slender.

PALÆOBLATTA PAUCINERVIS (Scudder).

Archimylacris paucinervis Scudder, Mem. Boston Soc., IV, 1890, p. 441, pl. xxxi, fig. 5.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38091, U.S.N.M.

APHTHOROBLATTINA, new genus.

Similar to the foregoing genus, but differs in the somewhat more abundant branching of the veins, the narrower costal area, and the more regular cross veins. The subcosta reaches about two-thirds the length of the wing. Radius and sector are divided in the typical manner; the former with about 5 small veinlets directed forward, the latter separated into 4 to 6 branches. The media separates about in the middle of the wing and forms about 4 offshoots. The 7 to 8 branches of the cubitus extend to the inner margin. Anal area slender; cross veins not very compact and somewhat irregular, but not so strongly reticulate. Body like that in *Palæoblatta.* Front wing scarcely 2½ times as long as broad.

Type of genus. *Aphthoroblattina fascigera* (Scudder).

APHTHOROBLATTINA FASCIGERA (Scudder).

Blattina fascigera Scudder, Proc. Boston Soc., XIX, 1878, p. 238.
Gerablattina fascigera Scudder, Mem. Boston Soc., III, 1879, p. 113, pl. vi, figs. 1, 2.

Locality.—Campbell's Ledge, near Pittston, Pennsylvania. Near top of Pottsville; upper transition group.

This form was pointed out by Scudder as the "oldest" blattid.

Two species from the middle of the Upper Carboniferous of Europe also belong in this genus.

Cotypes.—Cat. No. 38058, U.S.N.M.

POLYETOBLATTA, new genus.

Similar to the genus *Aphthoroblattina.* Anterior margin of the front wing strongly curved. Costal area narrow, extending two-thirds the length of the wing. Radius with 5 stouter branches directed upward; sector arising above the middle of the wing and divided into 3 forks, all of which end in the apical border. Media with 2 simple and 1 furcate branches directed toward the inner border and branching off backward from the main stem. The 5 simple oblique branches which extend downward from the strongly arcuate cubital vein occupy only the middle third of the posterior margin. Anal area small and slender, continuing only one-third the length of the wing, with but 4 or 5 veins ending in the inner margin. Interspaces filled up with very regular and delicate cross veins. Front wing fully 2½ times as long as broad.

POLYETOBLATTA CALOPTERYX, new species.

Locality.—Road from Hampton to Peachtree Creek, West Virginia. Pottsville ? (From Coal blum about 400 feet above Hornton conglomerate. Same as McGinness' mine.)

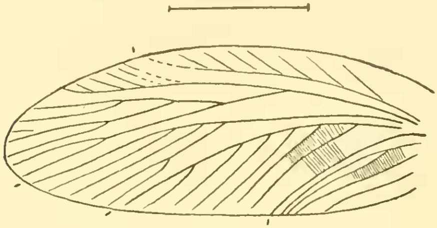


FIG. 40.—POLYETOBLATTA CALOPTERYX.

Length of front wing, 19 mm.
Holotype.—Cat. No. 25633, U.S.N.M.

KINKLIDOBLATTA, new genus.

Front wing fully 2½ times as long as broad, nearly elliptical, with strongly curved anterior margin. Costal area narrow, scarcely reaching over beyond the middle of the front margin. Subcosta with about 7 branches. Radius divided just above the middle of the wing; the superior branch (radius *s. str.*) forming a large fork, the inferior branch (sector) separated into two 4-branched parts. All offshoots of the radius are directed toward the anterior margin. The media sends off successively one furcate and 3 sample branches backward, all of which fuse in the apical border. The cubitus stretches obliquely backward and with its 6 branches occupies the entire space between the anal area and the apical margin, anal area taking up two-fifths the length of the wing, with numerous veins partly united at the base. About two-thirds of the wing appears to be firmly chitinized and shows no intercalary venation; the outer third, on the contrary, exhibits a dense, small meshed, and irregular network.

KINKLIDOBLATTA LESQUEREUXI (Scudder).

Etoblattina lesquereuxi SCUDDER, Mem. Boston Soc., III, 1879, p. 67, pl. VI, fig. 34.

Locality.—Near Pittston, Pennsylvania; Anthracite series; Roof shales; D seam.
Holotype.—Cat. No. 38077, U.S.N.M.

ADELOBLATTA, new genus.

Front wing about 2½ times as long as broad, nearly elliptical, with equally strongly curved anterior and posterior margins. Costal area of normal breadth, reaching somewhat over half the length of the wing.

Radius forked somewhat above the middle of the wing, the superior branch with about 3 or 4 twigs, the inferior strongly vaulted, with about 6 twigs, all of which are oriented toward the front margin. The branches of the strongly arcuate media issue posteriorly and turn in part to the apical border, in part to the inner margin, so that for the 4 to 5 branches of the cubitus but little more than the middle third of the margin remains. The anal area occupies about two-fifths of the length of the wing and is marked off by a strongly curved fold; it contains about 6 veins. Pronotum somewhat less than twice as broad as long and nearly semicircular in form. The intercalary venation is not known.

Type of genus, *Adeloblatta columbiana* (Scudder).

ADELOBLATTA COLUMBIANA (Scudder).

Progonoblattina columbiana Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 131, pl. xi, fig. 9.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

? ADELOBLATTA GORHAMI (Scudder).

Etoblattina gorhami Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 16, pl. ii, fig. a; No. 124, 1895, p. 80, pl. v, fig. 8.

Locality.—Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

PLAGIOBLATTA, new genus.

Front wing more than 2½ times as long as broad, nearly elliptical, with strongly curved anterior margin and more slightly arcuate inner border. Costal area not expanded at the base, extending about five-eighths the length of the wing, with about 8 branches. Radius vaulted, its superior principal branch separated into 4 to 5 twigs, which end in the anterior border, besides 4 to 6 mostly compound branches generally oriented toward the apical margin. Media proceeding obliquely backward and divided into 2, always 3 to 4 parted forks, whose branches in part fuse in the inner margin, so that the 5 to 6 offshoots of the cubitus take up not more than the middle third of the posterior border. The anal area reaches about two-fifths the length of the wing. The intercalary venation consists of distinct regular cross veins. The prothorax (preserved in one species) is almost transversely elliptical, and about one-fourth broader than long.

Type of genus, *Plagioblatta parallela* (Scudder).

PLAGIOBLATTA PARALLELA (Scudder).

Archimylacris parallela Scudder, Mem. Boston Soc., III, 1879, p. 85, pl. vi, fig. 6.

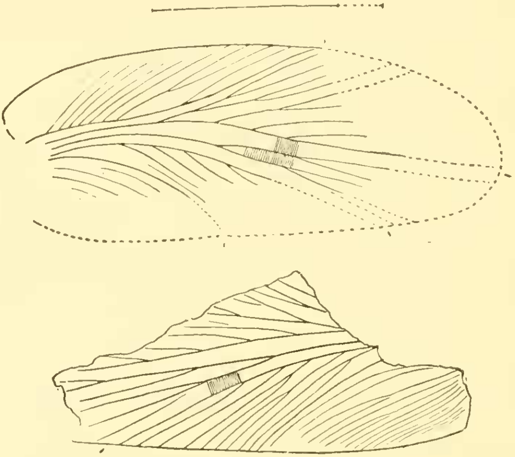
Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group; roof of the Middle Kittanning coal.

Holotype.—Cat. No. 38093, U.S.N.M.

PLAGIOBLATTA CAMPBELLI, new species.

Locality.—Railway cut, Moss Creek, one-half mile above Gorman's Mills, Pennsylvania. From shales about 40 feet below B coal (?). Pennsylvanian; Coal Measures? Conemaugh stage.

Length of the front wing about 30 mm. Costal area broader than in *Plagioblatta parallela*. Radius directed more to the middle of the apical border.



Figs. 41, 42.—Plagioblatta campbelli.

Cotypes.—Cat. No. 35391, U.S.N.M. Collected by Messrs. Burrows and Campbell. Survey of the Barnsboro, Pennsylvania, quadrangle.

SCHIZOBLATTA, new genus.

Front wing elliptical, about $2\frac{2}{5}$ times as long as broad. Costal area extending about three-fifths the length of the wing, with about 9 or 10 normal veins; not expanded at the base. Radius divided into 2 principal stems, the superior of which separates into 6 branches and the inferior into 8, the majority of the latter ending in the apical border. The media likewise divides into 2 main stems, the anterior of which forms 5 branches and the posterior 4, all of which fuse in the apical margin The 8 branches of the gently vaulted cubitus take up the entire inner border. The anal area attains nearly half the length of the wing. Cross veins are not to be distinguished, but instead there is a fine-grained leathery structure.

SCHIZOBLATTA ALUTACEA, new species.

Locality. Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

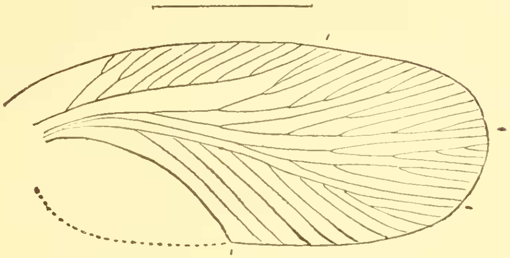


FIG. 43.—SCHIZOBLATTA ALUTACEA.

Length of front wing, 22 mm.

Holotype. Cat. No. 38668, U.S.N.M.

ATIMOBLATTA, new genus.

Front wing elongated, 2¾ times as long as broad, and subreniform, with strongly-arched front margin, very gently curved inferior border, and rounded apical edge, with a remarkably elongated anal area, which is fully half as long as the wing. Costal area extending three-fifths the length of the wing, band-shaped, with about 6 simple or forked veins. Superior branch of the radius emerging just below the first fourth of the length of the wing, and separated into 4 branches by double furcation; by repeated forking the inferior offshoot is divided into 8 to 9 branches, which in part fuse in the apical margin. The media stretches obliquely to the lower portion of the outer border, and sends off 3 nearly horizontal and in part furcate branches to the apical margin. The long, gently-arched cubitus joins the lower end of the apical border and sends off 5 to 6 simple, very oblique offshoots downward and outward. No distinct cross veins.

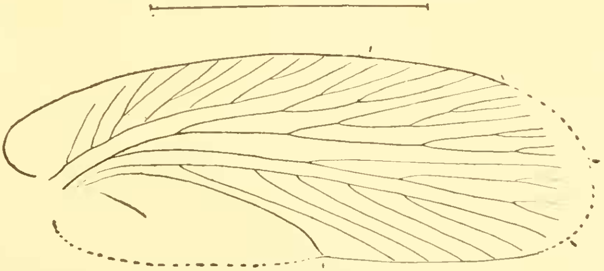


FIG. 44.—ATIMOBLATTA CURVIPENNIS.

Type of genus, *Atimoblatta curvipennis*, new species.

ATIMOBLATTA CURVIPENNIS, new species.

Locality.—Scranton, Pennsylvania. Uppermost Pottsville; Dunmore coal, No. 2.

Length of the front wing, 38 mm. The veins of the costal area are occasionally forked. Cubitus with 5 branches.

Holotype.—Cat. No. 35380, U.S.N.M.

ATIMOBLATTA RENIFORMIS, new species.

Locality.—Scranton, Pennsylvania. (Anthracite region.) Uppermost Pottsville: Dunmore coal, No. 2.

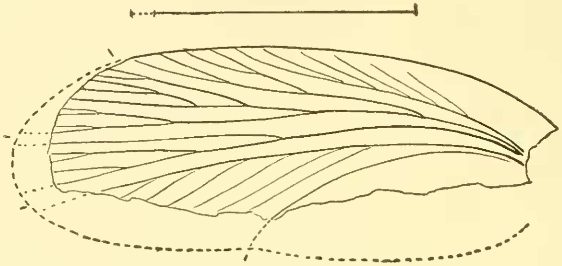


FIG. 45.—ATIMOBLATTA RENIFORMIS.

Length of front wing, about 38 mm. Very much like the previous species. Veins of the costal area not furcate. Cubitus with 6 veins.

Holotype.—Cat. No. 35383, U.S.N.M.

ASEMOBLATTA, new genus.

Front wing with gently arcuate front edge, obliquely truncate apical margin, and more strongly curved inner border; $2\frac{1}{3}$ to $2\frac{2}{3}$ times as long as broad. Costal area band-shaped, rather wide, and extending about three-fifths the length of the wing. Superior offshoot of the radius branching out above the middle of the wing, divided into 2 to 4 twigs; inferior branch of the radius separated into 5 to 9 twigs by repeated furcation. The media continues in a gentle oblique curve to the lower extremity of the apical margin, and sends off 3 to 5 more or less compound branches forward to the apical border. The likewise vaulted media reaches to the lower end of the apical edge, and with its 7 to 9 in part compound branches takes up the entire posterior margin. The anal area is proportionally short, and is marked off by a strongly curved fold; it occupies only one-third the length of the wing and contains but a limited number of veins. The intercalary venation is either obliterated by the strong chitinization of the wing or it consists of delicate and irregular cross veins. Prothorax nearly semicircular, about one-third to one-half broader than long.

Type of genus, *Asemoblatta anthracophila* (Germar).

ASEMOBLATTA PENNSYLVANICA, new species.

Locality.—Drake Tunnel, Old Forge, Pennsylvania. Anthracite series; Marcy or D Coal.

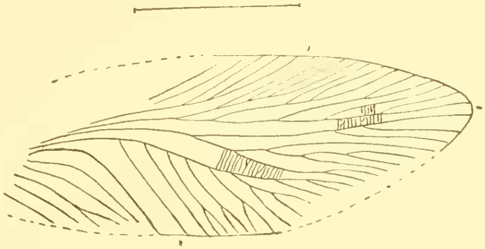


FIG. 46.—ASEMOBLATTA PENNSYLVANICA.

Length of front wing, 22 mm. Cross veins distinct.

Holotype.—Cat. No. 38799, U.S.N.M.

ASEMOBLATTA DANIELSI, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

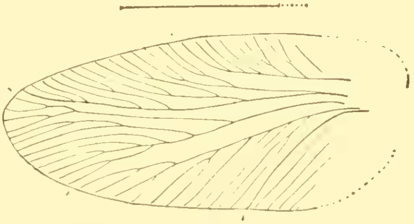


FIG 47.—ASEMOBLATTA DANIELSI.

Length of the front wing, 26 mm. No structure to be observed.

Daniels collection. Reverse of holotype in the U. S. National Museum. Cat. No. 35577.

ASEMOBLATTA MAZONA (Scudder).

Etoblattina mazona SCUDDER, Mem. Boston Soc., III, 1882, p. 181, pl. x; Bull. U. S. Geol. Surv., No. 124, 1895, p. 89, pl. VI, fig. 5.

Etoblattina mazona SELLARDS, Amer. Jour. Sci. (4), XVIII, 1904, p. 131, fig. 16.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Length of the front wing, 24 mm.

The young forms referred by Sellards to this species will be discussed in another place. I must here again call attention to the fact that the ovipositor represented by Sellards in the imago (fig. 15) was not observed, but is merely restored, and in further considerations should be received for the present with great reserve.

Holotype.—Cat. No. 38068, U.S.N.M.

ARCHOBLATTINA Sellards.

Front wing nearly elliptical, 2½ times as long as broad. Costal area extending about two-thirds the length of the wing, not expanded, with numerous, mostly compound veins. Superior offshoot of the radius more strongly branched than the inferior one, which is given off near the base. All branches of the radius end in the anterior margin. Media with 2 (or 3?) compound branches running off forward. Cubitus strongly vaulted, with many (about 9) mainly furcate veinlets, which take up the entire free inner border. Anal area wide, occupying two-fifths the length of the wing, with numerous veins. Pronotum not broader than long and of nearly pear-shaped outline. Very large forms.

Type of genus, *Archoblattina beecheri* (Sellards).

ARCHOBLATTINA BEECHERI Sellards.

Megablattina beecheri Sellards, Amer. Jour. Sci. (4), XV, 1903, p. 312, pl. VIII.
Archoblattina beecheri Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 218, figs. 30, 31, 32.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning? (Allegheny) stage.

The length of the front wing of this gigantic form amounts nearly to 70 mm.

The name *Megablattina*, being preoccupied, was changed by Sellards himself to *Archoblattina*.

? ARCHOBLATTINA SCUDDERI, new species.

Blattina sp. Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 142, pl. XII, fig. 5 (not pl. X, fig. 16).

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning? (Allegheny) stage.

A hind wing, about 55 mm. long, with numerous cross veins, which possibly may belong to the preceding species.

Holotype.—Cat. No. 38105, U.S.N.M.

GYROBLATTA, new genus.

Front wing 2⅓ times as long as broad, with very strongly curved front margin, and nearly straight posterior border, therefore nearly semicircular in form. The rather broad costal area reaches three-fourths the length of the wing, and contains about 7 many-times branched oblique offshoots, some of which are given off at the base. The radius forks very near the base of the wing and its superior branch separates into 4 to 6 twigs; the inferior, on the other hand, into 2 to 5. The media stretches in a strong vault to the inner border and sends off 3 to 4 long, more or less divided, branches horizontally forward to the tip of the wing. The much-reduced cubitus, with its about 4 mainly compound veinlets, occupies the middle portion of the inner margin, whose basal third is taken up by the short, broad anal area. In one species, distinct, closely crowded, and regular cross veins are present; in the other, there is nothing stated on this point.

Type of genus, *Gyroblatta clarkii* (Scudder).

GYROBLATTA CLARKII (Scudder).

Etoblattina clarkii Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 14, pl. II, fig. j; No. 124, 1895, pl. V, fig. 10.

Locality.—Pawtucket, Rhode Island, Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

? GYROBLATTA SCAPULARIS (Scudder).

Gerablattina scapularis Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, pl. II, fig. l; No. 124, 1895, pl. X, fig. 7.

Locality.—Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

Holotype.—Cat. No. 38060, U.S.N.M.

DYSMENES, new genus.

Front wing in any case very broad, probably not much more than twice as long as wide, with strongly arched anterior margin, and gently curved posterior border. Costal area wide, scarcely reaching two-thirds the length of the wing, with veins branching several times. Superior principal offshoot of the radius separated into 4 twigs, which, as well as the 6 twigs of the inferior branch, all run out to the front margin. The media proceeds obliquely to the apical border and sends out forward 4 compound branches. Near the base the cubitus divides into one superior, 3-parted branch, which extends to the apical edge, and into one normal branch reaching to the end of the inner margin, the twigs of which (about 5) are several times furcate and take up the entire posterior border. The broad anal area occupies somewhat more than one-third the inner margin. Nothing is said of cross veins.

DYSMENES ILLUSTRIS (Scudder).

Etoblattina illustris Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 12, pl. II, fig. i; No. 124, 1895, p. 70, pl. IV, fig. 11.

Locality.—Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

Holotype.—Cat. No. 38074, U.S.N.M.

PHOBEROBLATTA, new genus.

Front wing 2⅔ times as long as broad, with strongly arched anterior margin, very abruptly rounded apical border, and nearly straight posterior edge. Costal area narrow, attaining about three-fifths the length of the wing. The subcosta advances in an almost straight course to the anterior margin, and just at the base forms a many-times parted branch, which occupies nearly half the costal area; further on then follow 2 forked and 2 simple branches, all of which are very obliquely arranged. The radial vein proceeds in a nearly straight line to the end of the anterior border, and its first branch (radius *s. str.*) issues very near the base, by repeated furcation separating into 5 offshoots; the 3 following forked branches are very obliquely directed toward the front border. The media turns in a gentle vault toward the lower end of the apical margin, to which it sends out 2 forked, and one simple, very long branches. The entire inner edge is taken up by the 4 obliquely placed branches of the cubitus, which are separated into 14 twigs, only the basal third being filled by the small anal area, which has but a limited number of veins. The surface of the wing is coarse-grained leathery, rugose, with a tendency to the formation of cross veins.

In many respects this genus recalls *Eumorphoblatta*, but differs in form and structure.

PHOBEROBLATTA GRANDIS, new species.

Locality.—Fishing Creek Gap, in Sharp Mountain, Pennsylvania. Anthracite series; lower part; horizon?

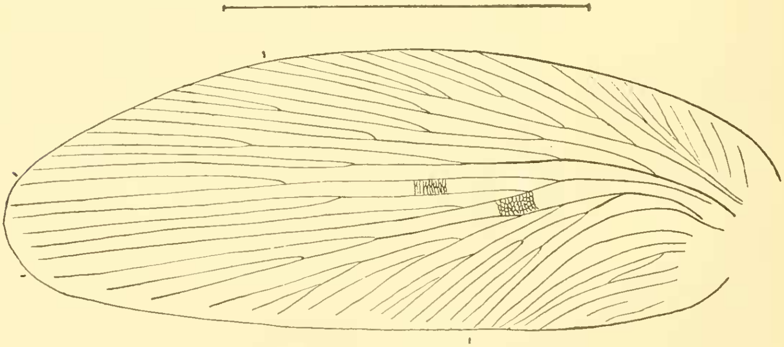


FIG. 48.—PHOBEROBLATTA GRANDIS.

The length of the front wing amounts to 50 mm.

Holotype. Cat. No. 38756, U.S.N.M.

EUMORPHOBLATTA, new genus.

Front wing 2¾ to 3 times as long as broad, elliptical, with almost equally strongly arched anterior and inner borders. The costal area extends two-thirds to three-fourths the length of the wing, and forms a very pointed triangle. The branches of the subcosta are united into several groups and very obliquely placed. The radius forks near the base of the wing, and its superior branch, divided into several twigs, advances obliquely to the anterior border, while the posterior twigs of the copiously branched main inferior offshoot fuse in the apical margin. The media stretches obliquely to the lower extremity of the apical edge, and sends out forward a series of simple or compound branches in a nearly horizontal direction toward the apical margin. The cubitus gives off a larger number of mostly simple branches toward the inner border and (in *Eumorphoblatta heros*) one furcate offshoot forward to the lower edge of the apical margin. The anal area occupies more than one-third the length of the wing. Cross veins are delicate and regular, very thickly crowded.

Type of genus, *Eumorphoblatta heros* (Scudder).

This genus is also represented in Europe.

EUMORPHOBLATTA HEROS (Scudder).

Necymylacris heros SCUDDER, Mem Boston Soc., III, 1879, p. 54, pl. v, fig. 9.

Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group: roof of the Middle Kittanning coal.

Holotype.—Cat. No. 38056, U.S.N.M.

METAXYBLATTA, new genus.

Front wing elongate-ovate, only a little more than twice as long as broad. Costal area the length of half the wing, wider at the base, and of more triangular form, with 5 (to 6?) mostly compound veins. The radius runs out nearly straight from the base to the end of the anterior border, and sends out 7 mostly forked oblique branches forward to the anterior margin; by dichotomous forking, the first of these offshoots separates into 4 twigs. The slightly vaulted media, with its 6 in part compound branches running off forward, takes up the entire apical margin. The cubitus advances obliquely to the end of the posterior border, and sends off to it 7 simple, regular branches. The small anal area contains few veins and is defined by a very slightly curved fold; it reaches about three-sevenths the length of the wing. I was able to make out nothing either of structure or cross veins.

METAXYBLATTA HADROPTERA, new species.

Locality. Port Griffith Switchback, Pennsylvania. Anthracite series; E coal.

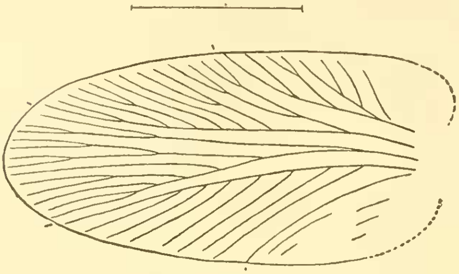


FIG. 49.—METAXYBLATTA HADROPTERA.

Length of the front wing, 23 mm.
Holotype.—Cat. No. 38783, U.S.N.M.

ARCHIMYLACRIS Scudder.

Front wing twice as long as broad, with very strongly arched anterior margin and gently curved inner border; hence, subreniform. Costal area extending two-thirds the length of the wing, band shaped, with 10 to 16 in part compound veins. Radius divided before or in the center of the wing; its upper branch sends off about 3 forked or simple twigs to the front margin, while the lower branch separates into 5 twigs, which are oriented toward the apical border. The media curves toward the lower end of the apical margin and sends out to it 3 to 4 offshoots, which branch off forward. The cubitus gives off 5 to 8 rather regular branches to the posterior border. The anal area contains only a limited number of veins and occupies about two-fifths the length of the wing. The cross veins are close and rather regular.

Type of genus, *Archimylacris acadica* Scudder.

ARCHIMYLACRIS ACADICA Scudder.

Archimylacris acadica SCUDDER, Dawson's Acadian Geol., 2 ed., 1868, p. 388, fig. 153; Mem. Boston Soc., III, 1879, p. 84, pl. VI, figs. 8, 14.

Locality. Main coal, East River, Picton, N. S. Pennsylvanian.

ARCHIMYLACRIS VENUSTA (Lesquereux.)

Blattina venusta LESQUEREUX, 2d Rept. Geol. Ark., 1860, p. 314, pl. V, fig. 11.
Etoblattina venusta SCUDDER, Mem. Boston Soc., III, 1879, p. 70, pl. VI, fig. 12.

Locality.—Frog Bayou, Arkansas. Upper coal-bearing division (? = Allegheny stage).

PHYLOBLATTA, new genus.

Under this name I include a series of forms with more or less regularly elliptical front wings, whose length is at least $2\frac{1}{4}$ times, but mainly $2\frac{1}{2}$ times as great as the breadth. The costal area is always band shaped, never especially wide, and also never particularly expanded at the base; it extends at least one-half, but chiefly three-fifths or two-thirds the length of the wing and contains a variously large number of veins. The radius always remains in the anterior half of the wing and occupies, with its forward-directed branches, the free portion of the front margin. The first of these veins is either simple or furcate or is divided into 3 to 5 twigs. The media stretches in a gentle curve to the lower end of the apical border or to the extremity of the posterior border and sends off forward a variously large number of more or less compound branches, mainly rather straight to the apical margin, which they almost entirely occupy. The cubitus, with its chiefly compound veinlets, takes up nearly the entire free inner border, and with its distal branches frequently reaches even to the lower end of the apical margin. The anal area extends one-third to two-fifths the length of the wing and contains a moderately large number of veins. The intercalary venation is either more rugosely leathery or more cross wrinkled. (?) Regular cross lines do not seem to be developed.

This genus, which is very abundant in forms, is spread over America and Europe, and seems to represent the origin of many more highly specialized types. The species are found in the upper parts of the Carboniferous formation and in the lower portion of the Permian formation. I am convinced that after further and more careful investigation of more abundant material many of the succeeding species will be combined.

Type of genus, *Phyloblatta schroeteri* (Giebel).

PHYLOBLATTA COMMUNIS (Scudder).

Etoblattina communis Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. vii, fig. 10 (not figs. 11 to 17).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

In my opinion, Scudder has united several species under the name *Etoblattina communis*, from which I select the one represented in fig. 10 as the type.

Cotype.—Cat. No. 38188, U.S.N.M.

PHYLOBLATTA MACROPTERA Handlirsch.

Etoblattina communis Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. vii, fig. 17 (not figs. 10 to 16).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38891, U.S.N.M.

PHYLOBLATTA MACILENTA (Scudder).

Etoblattina macilenta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 101, pl. VIII, fig. 9.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38163, U.S.N.M.

PHYLOBLATTA MUCRONATA (Scudder).

Etoblattina mucronata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 74, pl. V, fig. 3.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38199, U.S.N.M.

PHYLOBLATTA MEDIANA (Scudder).

Etoblattina mediana SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 69, pl. IV, fig. 4.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38198, U.S.N.M.

PHYLOBLATTA OVATA (Scudder).

Etoblattina ovata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, pl. IV, fig. 6.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38201, U.S.N.M.

PHYLOBLATTA DEDUCTA (Scudder).

Gerablattina deducta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 123, pl. X, fig. 15.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38063, U.S.N.M.

PHYLOBLATTA ABDICATA (Scudder).

Gerablattina abdicata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 118, pl. X, fig. 6.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38065, U.S.N.M.

PHYLOBLATTA UNIFORMIS (Scudder).

Gerablattina uniformis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 120, pl. x, fig. 8 (not figs. 9 to 11).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

In my opinion, the forms united by Scudder under the name *Gerablattina uniformis* belong in various species.

Cotype.—Cat. No. 38177, U.S.N.M.

PHYLOBLATTA FUNERARIA (Scudder).

Etoblattina funeraria SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 78, pl. v, fig. 5.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotype.—Cat. No. 38078, U.S.N.M.

PHYLOBLATTA LATA (Scudder).

Etoblattina lata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 67, pl. IV, fig. 2.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38200, U.S.N.M.

PHYLOBLATTA ANGUSTA (Scudder).

Etoblattina angusta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 100, pl. VIII, fig. 8.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38185, U.S.N.M.

PHYLOBLATTA RESIDUA (Scudder.)

Etoblattina residua SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 78, pl. v, fig. 1.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38179, U.S.N.M.

PHYLOBLATTA CASSVILLEANA, new species.

Gerablattina uniformis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 120, pl. x, fig. 10 (not figs. 8, 9, 11).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38892, U.S.N.M.

PHYLOBLATTA REGULARIS, new species.

Gerablattina uniformis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 120, pl. x, fig. 9 (not figs. 8, 10, 11).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38893, U.S.N.M.

PHYLOBLATTA ABBREVIATA, new species.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Front wing, 17 mm. long, $2\frac{1}{3}$ times as long as broad. Costal area occupying more than two-thirds the length of the wing. Radius but little vaulted, with 5 branches, of which only the second is compound. Media with one simple and 2 forked offshoots. Cubitus with about 6 branches, of which only the first is furcate. Distinct delicate cross veins.

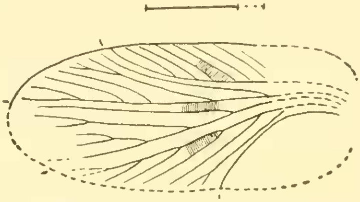


FIG. 50.—PHYLOBLATTA ABBREVIATA.

Holotype.—Cat. No. 38588, U.S.N.M.

PHYLOBLATTA MACTATA (Scudder.)

Etoblattina mactata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 92, pl. VII, fig. 9.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38081, U.S.N.M.

PHYLOBLATTA EXPUGNATA (Scudder).

Etoblattina expugnata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 102, pl. IX, fig. 4.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38193, U.S.N.M.

PHYLOBLATTA OBATRA (Scudder).

Etoblattina obatra SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 103, pl. IX, fig. 5.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38087, U.S.N.M.

PHYLOBLATTA ELATIOR, new species.

Etoblattina communis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. VII, fig. 14 (not figs. 10 to 13, 15 to 17).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38895, U.S.N.M.

PHYLOBLATTA DICHOTOMA, new species.

Etoblattina communis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. VII, fig. 11 (not figs. 10, 12 to 17).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38896, U.S.N.M.

PHYLOBLATTA FRACTA, new species.

Etoblattina communis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. VII, fig. 12 (not figs. 10, 11, 13 to 17).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38897, U.S.N.M.

PHYLOBLATTA ARCUATA, new species.

Etoblattina communis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. VII, fig. 13 (not figs. 10 to 12, 14 to 17).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38898, U.S.N.M.

PHYLOBLATTA MORTUA, new species.

Etoblattina communis SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 93, pl. VII, figs. 15, 16 (not figs. 10 to 14, 17).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38899, U.S.N.M.

PHYLOBLATTA EXSECUTA (Scudder).

Etoblattina exsecuta Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 96, pl. viii, fig. 4.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38180, U.S.N.M.

PHYLOBLATTA GRATIOSA (Scudder).

Etoblattina gratiosa Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 90, pl. iv, fig. 5.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38166, U.S.N.M.

PHYLOBLATTA VULGATA, new species.

Etoblattina expulsata Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 89, pl. ix, fig. 4 (not fig. 3).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38901, U.S.N.M.

PHYLOBLATTA VIRGINIANA, new species.

Etoblattina secreta Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 105, pl. ix, fig. 7 (not fig. 6).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38902, U.S.N.M.

PHYLOBLATTA IMMOLATA (Scudder).

Etoblattina immolata Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 92, pl. vii, fig. 7 (not fig. 8).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotype.—Cat. No. 38079, U.S.N.M.

PHYLOBLATTA DEBILIS, new species.

Etoblattina immolata Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 92, pl. vii, fig. 8.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38903, U.S.N.M.

PHYLOBLATTA ACCUBITA (Scudder).

Etoblattina accubita SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 88, pl. VII, fig. 2.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38169, U.S.N.M.

PHYLOBLATTA EXPULSATA (Scudder).

Etoblattina expulsata SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 89, pl. VII, fig. 3 (not fig. 4).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotype.—Cat. No. 38178, U.S.N.M.

PHYLOBLATTA MACERATA (Scudder).

Etoblattina macerata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 91, pl. VII, fig. 6.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38183, U.S.N.M.

PHYLOBLATTA IMPERFECTA (Scudder).

Etoblattina imperfecta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 104, pl. IX, fig. 8

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38083, U.S.N.M.

PHYLOBLATTA SECRETA (Scudder).

Etoblattina secreta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 105, pl. IX, fig. 6 (not fig. 7).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38167, U.S.N.M.

PHYLOBLATTA CONCINNA (Scudder).

Gerablattina concinna SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 119, pl. X, fig. 4 (not fig. 5).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38172, U.S.N.M.

PHYLOBLATTA SCUDDERIANA, new species.

Gerablattina concinna Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 119, pl. x, fig. 5 (not fig. 4).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38904, U.S.N.M.

PHYLOBLATTA PRÆDULCIS (Scudder).

Etoblattina prædulcis Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 98, pl. viii, fig. 12.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38165, U.S.N.M.

PHYLOBLATTA ROGI (Scudder).

Etoblattina rogi Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 102, pl. ix, figs. 2, 3.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38088, U.S.N.M.

? PHYLOBLATTA DIMIDIATA, new species.

Gerablattina uniformis Scudder (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 120, pl. x, fig. 11 (not figs. 8 to 10).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38905, U.S.N.M.

? PHYLOBLATTA REBAPTIZATA, new species.

Poroblattina gratiosa Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 136, pl. xi, fig. 13.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38106, U.S.N.M.

? PHYLOBLATTA HILLIANA.

Etoblattina hilliana Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 99, pl. viii, fig. 11.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

This, unfortunately, still imperfectly known form perhaps belongs in another genus.

Holotype.—Cat. No. 38069, U.S.N.M.

? PHYLOBLATTA SELLARDSII, new species,

Etoblattina hilliana? SELLARDS (not Scudder), Amer. Jour. Sci. (4), XVIII, 1894, p. 213, pl. I, fig. 4.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Similar to the preceding form, but probably to be regarded as a distinct species.

? PHYLOBLATTA OCCIDENTALIS (Scudder).

Etoblattina occidentalis SCUDDER, Mem. Boston Soc., IV, 1890, p. 410, pl. XXXII, fig. 4.

Locality.—Lawrence, Kansas Upper Coal Measures; Le Roy (Lawrence) shales.

This form also perhaps belongs in another genus.

Cotypes.—Cat. No. 38071, U.S.N.M.

DISTATOBLATTA, new genus.

Nearly related to *Phyloblatta.* Front wing similarly formed, 2½ times as long as broad. Costal area extended only a little beyond the middle of the wing. Radius proceeding in an almost straight course to the end of the anterior margin, with 6 simple or feebly branched offshoots. Media strongly vaulted, continuing to the middle of the apical border, with 3 long veinlets branching off forward. Cubitus strongly developed, stretching obliquely to the second third of the posterior border, with 6 branches directed backward; in addition, however, there are 3 compound branches running out forward to the apical margin. Anal area rather short. No cross veins.

DISTATOBLATTA PERSISTENS (Scudder.)

Etoblattina persistens SCUDDER, Mem. Boston Soc., IV, 1890, p. 459, pl. XLI, fig. 9; pl. XLII, figs. 10, 19.

Locality.—Fairplay, Colorado. Lower Permian.

METAXYS, new genus.

Front wing inclining somewhat to a cordate form, with rather broadly rounded apex, twice as long as wide. Costal area broad, half as long as the wing, inclining to a triangular shape, with 5 or 6 veins, some of which appear to be given off at the base of the wing. Radius strongly vaulted, not reaching to the apex; its branches directed toward the front margin; the first is furcate, the second twice forked, and third and fourth are simple. Media not strongly arcuate; its rambling compound branches directed forward toward the apical margin. Cubitus with few very strongly branched offshoots taking up the entire free inner margin. Anal area attaining two-fifths the length of the wing. The intercalary venation consists of irregular cross veins, thus causing the wing to appear reticulate.

This form is closely connected with *Phyloblatta*, and differs principally in the form of the costal area.

METAXYS FOSSA (Scudder).

Etoblattina fossa SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 70, pl. IV, fig. 5.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

AMOEBOBLATTA, new genus.

This genus stands very close to *Phyloblatta*, but differs in the expansion of the radius, which spreads over a large part of the apical margin, together with a reduction of the anastomosing media. Costal area extending almost four-fifths the length of the wing. Radius with 3 furcate and 1 simple branches, which occupy the larger part of the apical border. Media with but 1 short branch. Cubitus normal, with 7 simple offshoots. Anal area large, with 7 veins. The form of the wing appears to be like that in *Phyloblatta*, about 2½ times as long as broad. Cross veins are present.

AMOEBOBLATTA PERMANENTA (Scudder).

Gerablattina permanenta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 121, pl. X, fig. 12.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38064, U.S.N.M.

LIPAROBLATTA, new genus.

Related to *Phyloblatta*, but differing in the broader, more oval form of the wings, which are not quite twice as long as wide. The costal area extends nearly four-fifths the length of the wing and is band-shaped. The radius sends 3 to 4 variously branched members forward and takes up the upper part of the apical margin. The media proceeds obliquely to the end of the inner border and sends out 2 to 4 branches forward to the apical margin. The cubitus, with its 4 to 5 offshoots, occupies the greater portion of the posterior border. Anal area large, but short, with a limited number of branches. Cross veins are to be seen.

Type of genus, *Liparoblatta ovata* (Scudder).

LIPAROBLATTA OVATA (Scudder).

Gerablattina ovata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 126, pl. XI, fig. 4.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38170, U.S.N.M.

LIPAROBLATTA RADIATA (Scudder).

Gerablattina radiata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 124, pl. XI, fig. 1.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38175, U.S.N.M.

BRADYBLATTA, new genus.

Related to *Phyloblatta* and *Liparoblatta*, but differs in the much more bluntly cordate form of the wing, the length of which amounts to not quite twice the breadth. The relatively narrow, band-shaped costal area extends three-fifths the length of the wing. With its last branches, the radius continues down to the apical margin; it sends out 5 branches anteriorly, the first two of which always separate into 3 twigs. The media gives off 5 simple, parallel branches forward to the apical border. The cubitus is normally formed, with 7 offshoots branching backward. Anal area very large and not longer than high, with about 5 to 6 veins. Cross veins are not to be seen.

BRADYBLATTA SAGITTARIA (Scudder).

Etoblattina sagittaria SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 68, pl. IV, fig. 3.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38171, U.S.N.M.

EXOCHOBLATTA, new genus.

In form similar to *Bradyblatta*. Front wing cordate, twice as long as broad. Costal area band-shaped, but only half as long as the wing. Radius forming successively one simple branch, then one 4-parted, then one forked, and finally one more simple one, which take up the entire anterior margin. The media appears quite uniquely constructed; it advances in a short curve to the middle of the posterior margin and sends out toward the apical border 3 branches that are nearly parallel with each other as well as with the inner margin. The strongly reduced cubitus forms but 2 furcate offshoots, and the large anal area contains several compound veins. No cross veins.

EXOCHOBLATTA HASTATA (Scudder).

Petrablattina hastata Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 141, pl. xi, fig. 10.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38205, U.S.N.M.

ACOSMOBLATTA, new genus.

This genus is likewise derived from the *Phyloblatta* type, from which it is distinguished by a strong reduction of the radius with a corresponding enlargement of the media. The form of the wing is like that in *Phyloblatta*, about 2½ times as long as broad. The band-shaped costal area takes up at least two-thirds the length of the wing. The radius does not extend quite to the tip of the wing and gives off anteriorly but 2 simple branches; instead, however, the first branch of the media separates in 4 to 5 twigs. The 3 following branches of the media are normally directed toward the apical margin. The cubitus, as well as the anal area, are similar to those in *Phyloblatta*. Cross veins very delicate.

Type of genus, *Acosmoblatta permacra* (Scudder).

ACOSMOBLATTA PERMACRA (Scudder).

Gerablattina permacra Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 121, pl. x, fig. 13.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

ACOSMOBLATTA EAKINIANA (Scudder).

Etoblattina eakiniana Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 88, pl. vii, fig. 1.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38169. U.S.N.M.

AMBLYBLATTA, new genus.

Front wing broad, truncate, with somewhat diminished base, twice as long as wide. Costal area band-shaped, occupying nearly the entire anterior margin. Radius vaulted and ending nearly in the center of the apical border, with 2 furcate and 2 simple branches. Media strongly arcuate, with 2 dichotomous and 1 simple offshoots, which are directed forward toward the apical margin. The arcuation of the cubitus is S-shaped, and the vein fuses in the apical margin, with 7 mainly simple branches directed backward. Anal area short, defined by a very strongly curved fold, with 5 veins. Distinct tremulous cross lines.

AMBLYBLATTA LATA (Scudder).

Gerablattina lata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 125, pl. XI, fig. 2.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38174, U.S.N.M.

PENETOBLATTA, new genus.

Front wing broad, truncate, about twice as long as wide. Costal area reaching three-fourths the length of the wing. Radius vaulted, extending to the middle of the apical margin, with 4 more or less compound veins directed forward. Media divided into 2 principal stems, each of which forms about 5 twigs. The twigs of the main anterior branch run off backward and end in the apical border; those of the main posterior branch take up a portion of the inner margin. In consequence of this, the cubitus is somewhat more reduced and forms only about 4 branches, which occupy the central part of the posterior border. The cross veins are not well developed, being partially or wholly replaced by a close network.

Type of genus, *Penetoblatta virginiensis* (Scudder).

PENETOBLATTA VIRGINIENSIS (Scudder).

Anthracoblattina virginiensis SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 130, pl. XI, fig. 8.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38104, U.S.N.M.

PENETOBLATTA ROTUNDATA (Scudder).

Gerablattina rotundata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 126, pl. XI, fig. 3.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38171, U.S.N.M.

PAREINOBLATTA, new genus.

Front wing shaped like that in *Phyloblatta*, $2\frac{1}{2}$ times as long as broad. Costal area very narrow, extending two-thirds the length of the wing. Radius slightly vaulted and stretching toward the upper part of the apical border; its first branch consists of 5 twigs, while the second and third are simply forked. Media anastomosing with the radius to the first third of the length of the wing, then directed obliquely to the extremity of the inner margin, with 4 simple offshoots reaching forward to the apical border. The cubitus with its 6 branches takes up the greater part of the posterior margin. No cross veins are to be seen. Perhaps this genus will be combined with *Phyloblatta*.

PAREINOBLATTA EXPUNCTA (Scudder).

Etoblattina expuncta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 79, pl. v, fig. 6.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38192, U.S.N.M.

SYMPHYOBLATTA, new genus.

Front wing similarly shaped as in *Phyloblatta*, about 2¼ times as long as wide. Costal area broad, reaching two-thirds the length of the wing. Radius extending in a nearly straight course to the upper part of the apical margin, with about 6 to 7 regular simple branches. As in *Pareinoblatta*, the media and the radius are united almost to the first third of the length of the wing, then the latter advances obliquely to the extremity of the inner margin, with 3 (or 4 ?) simple offshoots directed toward the apical border. Cubitus with its 3 (or 4 ?) in part furcating branches taking up the greater part of the posterior edge. Anal area large, with 8 veins. Cross veins present. Perhaps this genus also will be combined with *Phyloblatta*.

SYMPHYOBLATTA DEBILIS (Scudder).

Etoblattina debilis SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 71, pl. IV, fig. 8.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38197, U.S.N.M.

APEMPHERUS, new genus.

Front wing shaped like that in *Phyloblatta*, 2½ to 2⅔ times as long as broad, costal area extending one-half to two-thirds the length of the wing. Radius slightly vaulted and fusing with the end of the anterior margin, with 4 to 7 branches. Media continuing obliquely to the extremity of the inner border, with 3 to 5 branches running off forward toward the apical margin and some running off backward to the posterior border. Cubitus reduced, with its about 5 veins taking up only the middle portion of the posterior margin. Anal area with numerous veins. No cross veins to be seen.

Type of genus, *Apempherus complexinervis* (Scudder).

APEMPHERUS COMPLEXINERVIS (Scudder).

Poroblattina complexinervis SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 139, pl. XI, fig. 14.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38204, U.S.N.M.

APEMPHERUS FOSSUS (Scudder).

Poroblattina fossa SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 137, pl. XI, fig. 15.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38203, U.S.N.M.

XENOBLATTA, new genus.

Front wing subelliptical, 2½ times as long as broad, costal area reaching three-fifths to three-fourths the length of the wing, band-shaped. The radius with its branches takes up the free portion of the upper margin and the greater part of the apical margin; its superior branch forms 3 to 4 twigs. The few offshoots of the media branch off forward and are directed obliquely backward to the end of the apical border. The cubitus does not reach the apical margin. The anal area occupies about two-fifths the length of the wing. The intercalary venation consists of delicate, irregular, somewhat crinkled cross veins.

Type of genus, *Xenoblatta fraterna* (Scudder).

One European species also belongs to this genus.

XENOBLATTA FRATERNA (Scudder).

Gerablattina fraterna SCUDDER, Bull. U. S. Geol. Surv., No. 101, 1893, p. 19, pl. II, figs. d, f; No. 124, 1895, pl. x, fig. 16.

Locality. East Providence, Rhode Island. Pennsylvanian: Tenmile series; Allegheny or Conemaugh stage.

Holotype.—Cat. No. 38059, U.S.N.M.

OLETHROBLATTA, new genus.

Front wing broadly elliptical, twice as long as wide, with very strongly arched front margin and symmetrically rounded apical border. Costal area of moderate breadth, band-shaped attaining three-fifths the length of the wing, with about 8 to 10 chiefly simple veins. Radius comparatively stout, directed forward, with 5 more or less compound veins oriented toward the anterior margin, the first of which remains simple. The media continues in a gentle curve through the middle of the wing and sends out 3 rarely compound branches forward to the apical margin. The slightly vaulted cubitus reaches to the extremity of the apical border and gives off 5 to 7 mainly simple branches to the inner margin. The anal area, which is marked off by a strongly curved fold, takes up two-fifths the length of the wing. The intercalary venation consists of delicate, closely crowded, undulating cross veins.

By the rounded form of the wing, the feebly branched veins, and the structure of the radius, this genus is adequately characterized.

Type of genus, *Olethroblatta intermedia* (Goldenberg).

OLETHROBLATTA AMERICANA, new species.

Locality.—Sharp Mountain Gap, near Tremont, Pennsylvania; Anthracite series; stage?

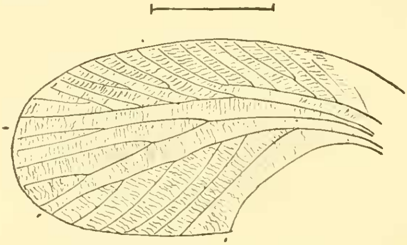


FIG. 51.—OLETHROBLATTA AMERICANA.

Length of the front wing, 17 mm. Cubitus with 5 unforked branches.

Holotype.—Cat. No. 38720, U.S.N.M.

STYGETOBLATTA, new genus.

Front wing about twice as long as broad, probably more kidney-shaped. Costal area remarkably wide and extending three-fourths the length of the wing, with 7 or 8 mostly simple veins. Radius forked about in the middle of the wing; its superior branch separated into 3 twigs, which continue to the anterior margin; the inferior offshoot not very strongly compound, with its branches directed toward the apical border. The media remains undivided beyond the middle of the wing and then separates into few veinlets, which are oriented toward the tip and inner margin. The cubitus with its few branches appears not quite to fill up the inner margin. The anal area is defined by a very strongly curved fold and contains only a limited number of veins. The surface of the wing appears leathery with a fine grain, and shows no cross veins.

A genus very well characterized by the broad costal area.

STYGETOBLATTA LATIPENNIS, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

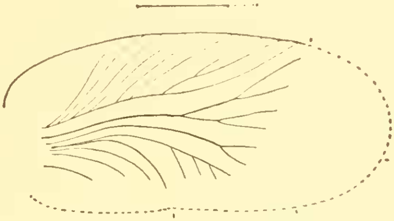


FIG. 52.—STYGETOBLATTA LATIPENNIS.

Length of the front wing, about 16 mm.

Holotype.—Cat. No. 38642, U.S.N.M.

METACHORUS, new genus.

Front wing of nearly cordate outline, about twice as long as broad. Costal area short, triangular, and not extending beyond half the length of the wing, with about 4 to 5 veins issuing successively from the subcosta. Radius divided into 2 main branches almost equally compound, the first of which sends out its twigs to the anterior border, while the twigs of the main inferior branch fuse in the apical margin. Media with 1 to 2 branches extending forward toward the lower portion of the tip. Cubitus strongly vaulted, with only 3 or 4 branches. The large anal area, defined by a strongly curved fold, reaches nearly half the length of the wing. In one species I discern distinct, delicate cross lines between the veins.

Type of genus, *Metachorus testudo* (Scudder).

METACHORUS TESTUDO (Scudder).

Promylacris testudo SCUDDER, Mem. Boston Soc., IV, 1890, p. 403, pl. XXXII, fig. 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning? (Allegheny) stage.

Plesiotype.—Cat. No. 38158, U.S.N.M.

METACHORUS STRIOLATUS, new species.

Locality.—Indian Territory. Pennsylvanian; ? Allegheny stage.

Length of the front wing, 15 mm. Costal area somewhat shorter than in *Metachorus testudo.* Fine, close cross stripes are distinctly to be seen.

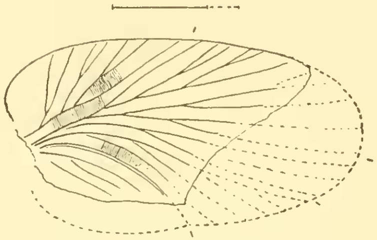


FIG. 53.—METACHORUS STRIOLATUS.

Holotype.—Cat. No. 35386, U.S.N.M.

Collector, J. A. Taff, of the U. S. Geological Survey.

OXYNOBLATTA, new genus.

Front wing cordate, twice as long as wide, and running off rather pointed. Costal area broad, not reaching quite two-thirds the length of the wing, with about 4 to 5 oblique veins, issuing successively from the subcosta. Radius divided into 2 main branches, and each of these into 4 twigs, all of which end in the front margin. The strongly arcuate media sends off 2 compound and 1 simple branches forward to the tip of the wing and to the extremity of the posterior margin. Like the media, the cubitus is vaulted and sends out 1 compound and 4 simple branches to the inner margin. The anal area occupies about two-fifths the length of the wing. Structure leathery.

Type of genus, *Oxynoblatta alutacea*, new species.

OXYNOBLATTA ALUTACEA, new species.

Locality.—Furnace Hollow, near mouth of Labor Creek, Wayne County, West Virginia. Allegheny series.

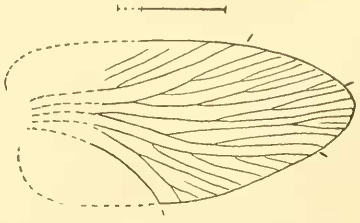


FIG. 54.—OXYNOBLATTA ALUTACEA.

Length of the front wing, about 14 mm. Distinguished by the remarkably pointed shape.

Holotype.—Cat. No. 35381, U.S.N.M.

Collected by Messrs. M. R. Campbell and W. C. Mendenhall, of the U. S. Geological Survey.

?OXYNOBLATTA TRIANGULARIS (Scudder).

Paromylacris triangularis SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 52, pl. III, fig. 3.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38046, U.S.N.M.

?OXYNOBLATTA AMERICANA (Scudder).

Anthracoblattina americana SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 129, pl. XI, fig. 7.

Locality.—Clinton, Missouri. Pennsylvanian; Kittanning (Allegheny) stage.

Holotype.—Cat. No. 38162, U.S.N.M.

DISCOBLATTA, new genus.

Front wing not quite twice as long as broad, oval. Costal area extending two-thirds the length of the wing, wide, with few veins very obliquely arranged. The branches of the slightly vaulted radius continue obliquely to the anterior margin and the first of these separates into 3 twigs, while the 4 succeeding ones are simple or furcate. The media sends out 2 strongly compound branches forward, nearly horizontally, to the apical border. The well-developed, slightly vaulted cubitus advances to the lower end of the apical border, which it entirely fills with its 8 more or less compound branches. The anal area is comparatively short, and is limited by a strongly curved vein. No mention is made of cross veins.

DISCOBLATTA SCHOLFIELDI (Scudder).

Etoblattina scholfieldi SCUDDER, Bull. U. S. Geol. Surv., No. 101, 1893, p. 15, pl. II, fig. b; No. 124, 1895, p. 71, pl. IV, fig. 7.

Locality.—East Providence, Rhode Island. Pennsylvanian: Tenmile series: Allegheny or Conemaugh stage.

Holotype.—Cat. No. 38076, U.S.N.M.

ARCHIMYLACRIDS OF DOUBTFUL SYSTEMATIC POSITION.

NECYMYLACRIS LACOANA Scudder.

Necymylacris lacoana SCUDDER, Mem. Boston Soc., III, 1879, p. 53, pl. V, fig. 12.

Locality.—Boston Mine, Pittston, Pennsylvania. Upper transition group.

This form may be regarded as type of the genus *Necymylacris.*

Holotype.—Cat. No. 38057, U.S.N.M.

(ARCHIMYLACRIDÆ) EXILIS (Scudder).

Etoblattina exilis Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 17, pl. II, fig. e; No. 124, 1895, p. 101, pl. IX, fig. 1.

Locality.—East Providence, Rhode Island. Pennsylvanian; Ten-mile series; Allegheny or Conemaugh stage.

(ARCHIMYLACRIDÆ) SEPULTA (Scudder).

Blattina sepulta Scudder, Proc. Amer. Assoc., XXIV, B, 1876, p. 111, fig. 2.

Petrablattina sepulta Scudder, Mem. Boston Soc., III, 1879, p. 125, pl. VI, fig. 7.

Locality.—Sydney, Cape Breton. Middle Coal formation; ? Allegheny stage.

(ARCHIMYLACRIDÆ) MEIERI (Scudder).

Petrablattina meieri Scudder, Proc. Acad. Nat. Sci. Phila., 1885, p. 38; Mem. Boston Soc., IV, 1890, p. 465, pl. XLII, fig. 17.

Poroblattina meieri Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 138.

Locality.—Fairplay, Colorado. Lower Permian.

(ARCHIMYLACRIDÆ) PERITA (Scudder).

Gerablattina perita Scudder, Bull. U. S. Geol. Surv., No 124, 1895, p. 114, pl. IX, fig. 17.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38061, U.S.N M.

(ARCHIMYLACRIDÆ) INCULTA (Scudder).

Gerablattina inculta Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 113, pl. IX, fig. 16.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38173, U.S.N.M.

(ARCHIMYLACRIDÆ) JEFFERSONIANA (Scudder).

Etoblattina jeffersoniana Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 77, pl. V, fig. 7.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

PETRABLATTINA ÆQUA Scudder.

Petrablattina æqua Scudder, Proc. Acad. Nat. Sci. Phila., 1885, p. 38; Mem. Boston Soc., IV, 1890, p. 465, pl. XLII, fig. 13.

Locality.—Fairplay, Colorado. Lower Permian.

This unfortunately very imperfectly preserved form must be recognized as the type of the genus *Petrablattina;* it appears to be closely related to *Phyloblatta.*

(ARCHIMYLACRIDÆ) EVERSA (Scudder).

Gerablattina eversa SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 122, pl. x, fig. 14.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Is most probably a species of *Phyloblatta.*

Holotype.—Cat. No. 38066, U.S.N.M.

(ARCHIMYLACRIDÆ) CORIACEA (Sellards).

Etoblattina coriacea SELLARDS, Amer. Jour. Sci. (4), XVIII, 1904, p. 213, fig. 29, pl. I, fig. 11.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

Family SPILOBLATTINIDÆ, new family.

In this family I unite a series of forms from the upper part of the Upper Carboniferous and from the Permian formation of Europe and America. These forms permit themselves to be readily derived from the archimylacrids, from which they differ only in a character of relatively limited morphological importance. In the central portion of the front wing the interspaces between the main veins are remarkably broad, and it seems as though the wing membrane in this place must have been very delicate, for on the impression along the veins there is always a thicker edge, in which remnants of cross veins are to be seen; these, however, do not extend over the entire interval, so that in all large interspaces fenestrate, empty patches occur.

The costal area is always band shaped, of various lengths, and the branches of the subcosta successively arise in a pectinate manner. The radius separates either in 2 widely compound main branches or it sends out forward a larger number of feebly compound offshoots. The media only rarely divides into 2 equally branched principal stems, but mainly forms a series of branches running out forward; posteriorly the branches run out in a single fold. The cubitus is formed like that in the archimylacrids, as well as the anal area, the veins of which always end in the inner margin.

SYSCIOPHLEBIA, new genus.

Front wing subreniform, with strongly arcuate front margin and slightly curved inner border, about $2\frac{1}{2}$ times as long as wide, with more or less broadly rounded apical edge. Costal area reaching at least one-half and rarely more than two-thirds the length of the wing. The branches of the media always run off forward and are directed toward the apical margin. The branches of the radius take up the entire anterior margin; those of the cubitus the entire posterior border. Anal area marked off by a strongly curved fold.

Numerous forms from Europe and America.

Type of genus, *Sysciophlebia euglyptina* (Germar).

I am convinced that, after a careful investigation of very abundant material, many of the species separated by me will be combined. However, in order that an arbitrary association may be avoided, it will be necessary first to determine exactly the limits of variation in recent forms. So long as that is not done, I consider it advisable to separate the fossil forms rather than unnaturally and arbitrarily to unite them.

SYSCIOPHLEBIA ARCUATA (Sellards).

Gerablattina arcuata SELLARDS, Amer. Jour. Sci. (4), XVIII, 1904, p. 216, fig. 1, pl. I, fig. 7.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

SYSCIOPHLEBIA WHITEI, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

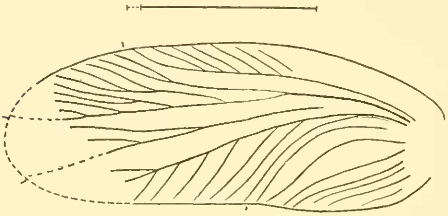


FIG. 55.—SYSCIOPHLEBIA WHITEI.

Length of the front wing, 26 mm. Costal area narrow, extending three-fourths the length of the wing. The 5 branches of the radius are directed obliquely forward, the first being furcate, the second twice divided. Media with few offshoots directed forward. Cubitus strongly arcuate, with 7 or 8 simple branches. Anal area with 7 veins. The wing has a more kidney-shaped form, and is more than 2½ times as long as wide. The veins are distinctly bordered.

The specific name is in honor of Dr. David White of the U. S. Geological Survey.

Holotype.—Cat. No. 38697, U.S.N.M.

SYSCIOPHLEBIA SCUDDERI, new species.

Etoblattina gracilenta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 95, fig. 7 (not fig. 6).

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

It seems to me that Scudder has combined several species under *Etoblattina gracilenta.*

SYSCIOPHLEBIA HYBRIDA, new species.

Etoblattina maledicta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 83, pl. VI, fig. 3 (not figs. 1, 2).

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA MALEDICTA (Scudder).

Etoblattina maledicta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 83, pl. VI, fig. 1 (not figs. 2, 3).

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA BENEDICTA (Scudder).

Etoblattina benedicta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 84, pl. V, fig. 4.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA SELLARDSII, new species.

Spiloblattina maledicta SELLARDS (not Scudder) (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 214, fig. 26, pl. I, fig. 5 (not figs. 6, 10).

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shale.

I do not regard this form as identical with *Sysciophlebia maledicta* Scudder or *S. benedicta* Scudder, since it differs from both in many respects and comes from quite other beds. In my opinion, Sellards goes much too far in the association of forms, and if we should follow his example, we must unite all Carboniferous blattids in few species.

SYSCIOPHLEBIA LAWRENCEANA, new species.

Spiloblattina maledicta SELLARDS (not Scudder) (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 214, fig. 27, pl. I, fig. 6 (not figs. 5, 10).

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

I consider this species sufficiently distinct from the preceding, and also believe that among the intermediate forms mentioned by Sellards other species will yet be found, of which, naturally, I can form no opinion so long as they are not figured.

SYSCIOPHLEBIA AFFINIS, new species.

Etoblattina benedicta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 84, pl. V, fig. 15 (not fig. 14).

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

This appears to be different from *Etoblattina benedicta* Scudder.

SYSCIOPHLEBIA RAMOSA (Scudder).

Etoblattina ramosa Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 81, pl. v, fig. 12.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA VARIEGATA (Scudder).

Etoblattina variegata Scudder, Proc. Boston Soc., XXIV, 1889, p. 51; Bull. U. S. Geol. Surv., No. 124, 1895, p. 99, pl. viii, fig. 10.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA SCHUCHERTI, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, 26 mm. long, 2½ times as long as broad. Costal area half as long as the wing. Radius with 6 branches, the first (3-parted) and second (furcate) of which arise from one point; the third and fourth offshoots are forked, the fifth and sixth, simple. The media forms 3 compound branches, the cubitus about 7 simple ones. Veins distinctly bordered.

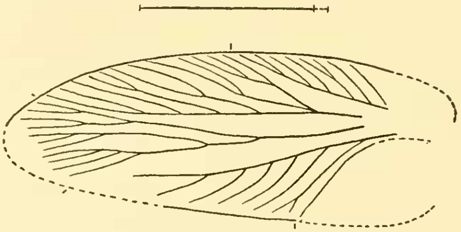


Fig. 56.—Sysciophlebia schucherti.

Holotype.—Cat. No. 38691, U.S.N.M.

SYSCIOPHLEBIA PICTA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

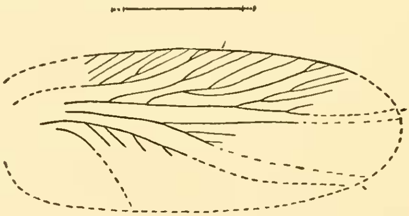


Fig. 57.—Sysciophlebia picta.

Length of the front wing, 22 mm. The costal area extends half the length of the wing. Radius with 4 branches, the first of which forms 2 twigs, the second and third always 3 twigs. Media with 3 or 4 offshoots. Veins bordered.

Holotype.—Cat. No. 38673, U.S.N.M.

SYSCIOPHLEBIA ADUMBRATA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Length of the front wing, about 26 mm. Scarcely 2½ times as long as broad. Costal area hardly more than half as long as the wing. Radius with 4 branches, of which the first forms 3, the second, 6, and the third, 3 twigs. Media with 4 branches. Cubitus extended, with about 9 chiefly simple branches. Veins bordered.

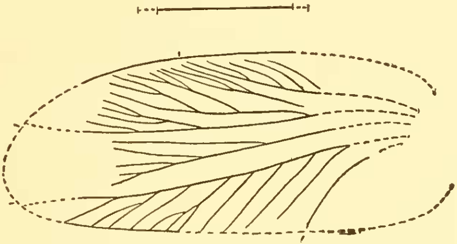


FIG. 58.—SYSCIOPHLEBIA ADUMBRATA.

Holotype.—Cat. No. 38640, U.S.N.M.

SYSCIOPHLEBIA FUNESTA (Scudder).

Etoblattina funesta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 85, pl. VI, fig. 4.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA ROTUNDATA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

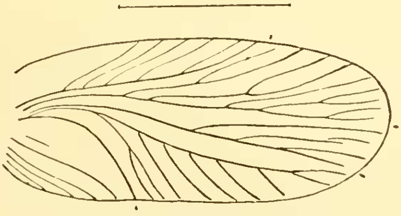


FIG. 59—SYSCIOPHLEBIA ROTUNDATA.

Front wing, 23 mm. long, less than 2½ times as long as broad. Costal area attaining two-thirds the length of the wing. Radius with 5 branches, the first, second, and fourth of which are furcate. Media with 3 simple offshoots. Cubitus vaulted, with 7 branches, the first of which is forked. Apical border broadly rounded.

Holotype.—Cat. No. 38651, U.S.N.M.

SYSCIOPHLEBIA NANA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, 20 mm. long, not quite 2½ times as long as broad. Costal area reaching half the length of the wing. Radius with 5 branches, the first, third, fourth, and fifth of which are forked, and the second is divided into 3 twigs. Media with 2 offshoots. Cubitus with 8 simple branches directed backward, and with one offshoot directed backward. Veins bordered.

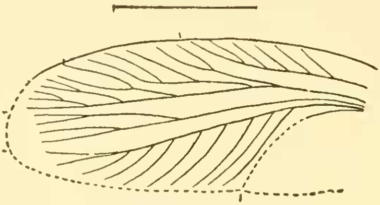


FIG. 60—SYSCIOPHLEBIA NANA.

Holotype.—Cat. No. 38648, U.S.N.M.

SYSCIOPHLEBIA OBTUSA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, 22 mm. long, scarcely 2⅓ times as long as wide. Costal area extending half the length of the wing, and obliquely truncate at the end. Radius with 5 branches, the second of which is twice furcate, all others being simply forked. Media with 2 compound branches. Cubitus with about 8 or 9 simple offshoots.

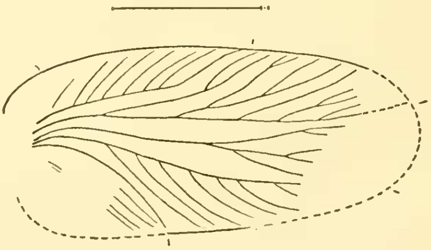


FIG. 61—SYSCIOPHLEBIA OBTUSA.

Holotype.—Cat. No. 38660, U.S.N.M.

SYSCIOPHLEBIA ACUTIPENNIS, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, about 29 mm. long, fully 2½ times as long as broad, and more pointed than in the other species. Costal area reaching somewhat beyond half the length of the wing. Radius with 6 almost uniformly furcate branches and with one simple veinlet. Media with 3 offshoots. Cubitus strongly vaulted, with about 7 more or less compound branches turning backward, and with one forked offshoot branching forward. Veins bordered.

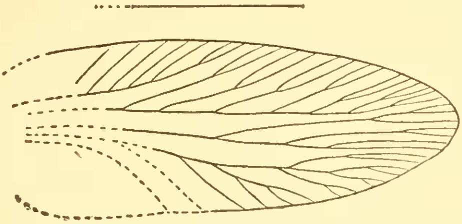


Fig. 62.—Sysciophlebia acutipennis.

Holotype.—Cat. No. 38639, U.S.N.M.

SYSCIOPHLEBIA HASTATA (Scudder).

Etoblattina hastata Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 94, pl. viii, fig. 1.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA FASCIATA (Scudder).

Etoblattina fasciata Scudder, Proc. Boston Soc., XXIV, 1889, p. 47; Bull. U. S. Geol. Surv., No. 124, 1895, p. 81, pl. v, fig. 11.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA MARGINATA (Scudder).

Etoblattina marginata Scudder, Proc. Boston Soc., XXIV, 1889, p. 48; Bull. U. S. Geol. Surv., No. 124, 1895, p. 95, pl. viii, fig. 2.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA APICALIS (Scudder).

Gerablattina apicalis Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 114, pl. ix, fig. 18.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOPHLEBIA CASSVICI (Scudder).

Gerablattina cassvici Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 117, pl. x, figs. 2, 3.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38176, U.S.N.M.

SYSCIOPHLEBIA DIVERSIPENNIS (Scudder).

Gerablattina diversipennis Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 115, pl. ix, fig. 15.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

SYSCIOPHLEBIA OCCULTA (Scudder).

Etoblattina occulta Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 107, pl. ix, fig. 13.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38085, U.S.N.M.

SYSCIOPHLEBIA PATIENS (Scudder).

Etoblattina patiens Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 73, pl. iv, fig. 9.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38184, U.S.N.M.

? SYSCIOPHLEBIA RECIDIVA (Scudder).

Etoblattina recidiva Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 109, pl. ix, fig. 14.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38202, U.S.N.M.

SYSCIOPHLEBIA TRIASSICA (Scudder).

Spiloblattina triassica Scudder, Proc. Acad. Nat. Sci. Phila., 1885, p. 36; Mem. Boston Soc., IV, 1890, p. 461, pl. xli, fig. 1.

Locality.—Fairplay, Colorado. Lower Permian.

SYSCIOPHLEBIA GUTTATA (Scudder).

Spiloblattina guttata Scudder, Proc. Acad. Nat. Sci. Phila., 1885, p. 36; Mem. Boston Soc., IV, 1890, p. 461, pl. xli, fig. 2; pl. xlii, fig. 14.

Locality.—Fairplay, Colorado. Lower Permian.

SYSCIOPHLEBIA FENESTRATA, new species.

Spiloblattina gardineri SCUDDER (part), Mem. Boston Soc., IV, 1890, p. 461, pl. XLVI, fig. 8.

Locality.—Fairplay, Colorado. Lower Permian.

SYSCIOPHLEBIA INVISA (Scudder).

Etoblattina invisa SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 106, pl. IX, fig. 9.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38164, U.S.N.M.

DICLADOBLATTA, new genus.

Very closely related to the genus *Sysciophlebia*, differing principally in the structure of the media, which separates into 2 equivalent, widely ramifying, main branches. The costal area extends half the length of the wing and is of more pointed, triangular form. The equivalent branches of the radius proceed forward and are feebly compound. Cubitus, form of the wing, and anal area like those in *Sysciophlebia*.

Type of genus, *Dicladoblatta tenuis* (Scudder).

DICLADOBLATTA TENUIS (Scudder).

Etoblattina tenuis SCUDDER, Proc. Boston Soc., XXIV, 1889, p. 46; Bull. U. S. Geol. Surv., No. 124, 1895, p. 87, pl. VI, fig. 6.

Locality.—Richmond, Ohio. Conemaugh formation: shales above the Ames limestone.

DICLADOBLATTA WILLSIANA (Scudder).

Etoblattina willsiana SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 82, pl. V, fig. 13.

Locality.—Richmond, Ohio. Conemaugh formation: shales above the Ames limestone.

DICLADOBLATTA DEFOSSA (Scudder).

Etoblattina defossa SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 108, pl. IX, fig. 12.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38194, U.S.N.M.

? DICLADOBLATTA MARGINATA (Scudder).

Spiloblattina marginata SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 37; Mem. Boston Soc., IV, 1890, p. 461, pl. XLI, fig. 3.

Locality.—Fairplay, Colorado. Lower Permian.

SYSCIOBLATTA, new genus.

Very similar to the two preceding genera. Costal area band shaped, extending one-half to two-thirds the length of the wing. Radius divided into 2 main offshoots, the superior of which sends out anteriorly at least 4, but usually more twigs, while the inferior one branches off in various ways. Media with few branches directed forward. Cubitus, anal area, and form of the wing like those in the foregoing genera. Veins usually distinctly bordered.

Type of genus, *Syscioblatta dohrnii* (Scudder).

SYSCIOBLATTA EXSENSA (Scudder).

Etoblattina exsensa SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 86, pl. VI, figs. 7, 8.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOBLATTA OBSCURA, new species.

Etoblattina maledicta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 83, pl. VI, fig. 2 (not figs. 1, 3).

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOBLATTA ANOMALA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

A fragment of a very slender front wing, about 25 mm. long. The superior branch of the radius separates into at least 6 (probably more) twigs. Near its extremity the media first sends out anteriorly 5 short simple branches. The cubitus forms about 10, almost entirely simple offshoots. Veins distinctly bordered.

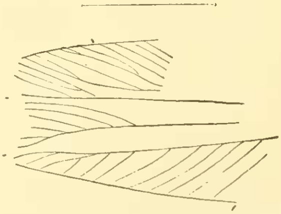


FIG. 63—SYSCIOBLATTA ANOMALA.

Holotype.—Cat. No. 38653, U.S.N.M.

SYSCIOBLATTA MINOR, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

A large piece, about 20 mm. long, from the middle of a long front wing, the length of which may have mounted to somewhat less than 2½ times the breadth. Costal area extending about three-fifths the length of the wing. Superior branch of the radius with 4 twigs, inferior branch with about 8. Media with 2 (or 3?) branches. Cubitus with about 6 simple or furcate offshoots. Veins bordered.

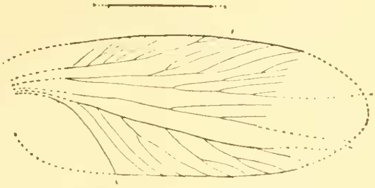


FIG. 64.—SYSCIOBLATTA MINOR.

Holotype.—Cat. No. 38665, U.S.N.M.

SYSCIOBLATTA HUSTONI (Scudder).

Etoblattina hustoni SCUDDER, Proc. Boston Soc., XXIV, 1889, p. 53; Bull. U. S. Geol. Surv., No. 124, 1895, p. 87, pl. VI, fig. 9.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOBLATTA GRACILENTA (Scudder).

Etoblattina gracilenta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 95, pl. VIII, fig. 6 (not fig. 7).

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

SYSCIOBLATTA STEUBENVILLEANA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, 24 mm. long, 2½ times as long as broad. Costal area reaching two-thirds the length of the wing. Superior branch of the radius separated into 6 twigs, the inferior branch into about 5. Media with 2 short offshoots. Cubitus with about 8 to 9 mainly simple branches. Veins bordered.

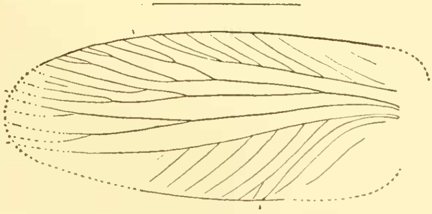


FIG. 65.—SYSCIOBLATTA STEUBENVILLEANA.

Holotype.—Cat. No. 38671, U.S.N.M.

SYSCIOBLATTA MISERA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, 28 mm. long, 2½ times as long as broad, costal area attaining three-fifths the length of the wing. Superior branch of the radius with 5 offshoots, inferior branch probably with 6 twigs. Media with 2 or 3 short branches. Cubitus with 4 furcate branches extending backward and one branching off anteriorly. Veins bordered.

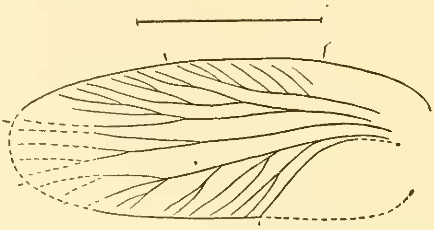


FIG. 66.—SYSCIOBLATTA MISERA.

Holotype.—Cat. No. 38658, U.S.N.M.

SPILOBLATTINA Scudder.

Very nearly related to the preceding genera. Front wing rather slender, 2½ to 3 times as long as broad. Costal area narrow, reaching one-half to three-fifths the length of the wing. Radius vaulted, attaining not quite to the extremity of the anterior margin, with a larger number of branches directed forward, the first of which separates into 4 to 5 twigs. Media first divides below the middle of the wing into 2 main branches, the twigs of which again run off backward. The cubitus is very strongly vaulted and forms about 8 to 10 simple branches. Intercalary venation finely reticulate. Interspaces between the main veins made wider by strong fenestration.

Type of genus, *Spiloblattina gardineri* Scudder (restricted).

SPILOBLATTINA GARDINERI Scudder.

Spiloblattina gardineri SCUDDER (part), Proc. Acad. Nat. Sci. Phila., 1885, p. 36; Zittel's Handbuch, 1885, p. 754, fig. 933; Mem. Boston Soc., IV, 1890, p. 461, pl. XLI, fig. 10.

Locality.—Fairplay, Colorado. Lower Permian.

In my opinion, Scudder has united several different forms under this name, of which the one first figured I regard as the type of the species.

SPILOBLATTINA PERFORATA, new species.

Spiloblattina gardineri SCUDDER (part), Proc. Acad. Nat. Sci. Phila., 1885, p. 36; Mem. Boston Soc., IV., 1890, p. 461, pl. XLI, fig. 6.

Locality.—Fairplay, Colorado. Lower Permian.

ARRHYTHMOBLATTA, new genus.

Front wing somewhat curved, 2½ times as long as broad. Costal area very narrow, reaching about three-fifths the length of the wing. Radius not extending to the end of the anterior border, or scarcely so, with 4 very oblique, simple, or furcate branches. Media very strongly developed, with its 4 offshoots, which branch off anteriorly and of which the first forms several twigs, taking up the entire apical margin and the terminal portions of the front and inner borders. Cubitus, therefore, not reaching the end of the posterior margin, with 6 to 9 mainly simple branches directed backward. Anal area broad and short, with about 7 veins. Interspaces between the principal veins very wide in the middle of the wing. No distinct cross veins.

Type of genus, *Arrhythmoblatta detecta* (Scudder).

ARRHYTHMOBLATTA DETECTA (Scudder).

Etoblattina detecta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 75, pl. IV, fig. 12 (not fig. 13).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Cotypes.—Cat. No. 38084, U.S.N.M.

ARRHYTHMOBLATTA SCUDDERIANA, new species.

Etoblattina detecta SCUDDER (part), Bull. U. S. Geol. Surv., No. 124, 1895, p. 75, pl. IV, fig. 13 (not fig. 12).

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38894, U.S.N.M.

AMETROBLATTA, new genus.

Front wing of more compressed form, subreniform. Costal area extending two-thirds the length of the wing. The radius with its branches, in addition to the anterior margin, takes up a large part of the apical border; the 4 divisions branch off forward and the first is furcate, the second separates into 6 twigs, the third into 3 twigs. In the figure, the media is represented as a simple unbranched vein. The cubitus divides close to the base into one long superior branch, several twigs of which are given off to the apical border, and into the inferior branch that continues obliquely to the extremity of the inner margin and gives off posteriorly about 6 branches. The large, broad anal area is limited by a strongly curved fold and contains about 7 veins. Cross veins are not to be seen distinctly.

Type of genus, *Ametroblatta strigosa* (Scudder).

AMETROBLATTA STRIGOSA (Scudder).

Etoblattina strigosa Scudder, Proc. Boston Soc., XXIV, 1889, p. 52; Bull. U. S. Geol. Surv., No. 124, 1895, p. 72, pl. IV, fig. 10.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

?AMETROBLATTA LONGINQUA (Scudder).

Poroblattina longinqua Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 135, pl. XI, fig. 12.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

ATACTOBLATTA, new genus.

Front wing remarkably slender, more than 3 times as long as broad, with more strongly curved anterior margin and slightly arcuate inner border. Costal area band-shaped, but short, reaching but two-fifths the length of the wing. The longitudinally extended radius, with its 6 forked offshoots branching off forward, fills up the entire anterior margin. The gently vaulted media passes through the middle of the wing and sends out posteriorly 3 long oblique branches toward the apical margin. The long cubitus, with its about 9 mainly forked branches directed backward, takes up the largest part of the posterior border. The veins are bordered, and in the edges traces of cross veins are to be seen. The interspaces between radius, media, and cubitus are very wide; consequently the radius approaches very close to the subcosta.

ATACTOBLATTA ANOMALA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

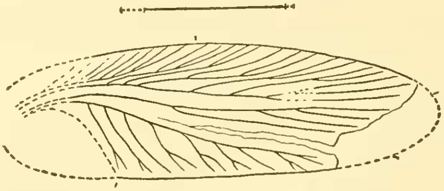


FIG. 67.—ATACTOBLATTA ANOMALA.

The length of the wing amounts to about 22 mm.

Holotype.—Cat. No. 38698, U.S.N.M.

DORYBLATTA, new genus.

Front wing slender, lancet-shaped, 3 times as long as broad, with almost equally curved anterior and posterior margins. Costal area attaining about half the length of the wing, band-shaped. Radius reaching the tip of the wing in a gentle vault, with 5 offshoots branching anteriorly, the first of which forms 5, the second 4, and the third 3 twigs. Below the middle of the wing, the media divides into 2 main branches, the superior of which separates into 4 twigs and the inferior into 3, oriented toward the end of the inner margin. The cubitus sends out backward 9 simple or furcate branches. The anal area is long, and is defined by a slightly vaulted vein; it contains 6 veins, which are bordered.

DORYBLATTA LONGIPENNIS, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

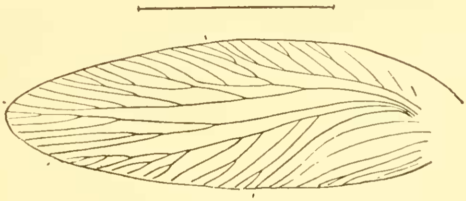


FIG. 68.—DORYBLATTA LONGIPENNIS.

The length of the front wing amounts to 26 mm.

Holotype.—Cat. No. 38662, U.S.N.M.

SPILOBLATTINIDS OF DOUBTFUL POSITION.

(SPILOBLATTINIDÆ) BALTEATA Scudder.

Gerablattina balteata SCUDDER, Mem. Boston Soc., III, 1879, p. 110, pl. VI, figs. 9, 10.

Etoblattina balteata SCUDDER, Proc. Boston Soc., XXIV, 1889, pp. 46, 48.

Locality.—Cassville. West Virginia. Dunkard formation; Lower Permian.

(SPILOBLATTINIDÆ) GARDINERI Scudder.

Spiloblattina gardineri SCUDDER (part), Mem. Boston Soc., IV, 1890, p. 461, pl. XLI, fig. 4.

Locality.—Fairplay, Colorado. Lower Permian.

(SPILOBLATTINIDÆ) species. (Hind wing).

Spiloblattina maledicta SELLARDS (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 214, pl. I, fig. 10.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

This may belong to *Sysciophlebia.*

(SPILOBLATTINIDÆ) species. (Abdomen.)

Spiloblattina sp. SELLARDS, Amer. Jour. Sci. (4), XVIII, 1904, p. 133, fig. 22.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

Family MYLACRIDÆ Scudder.

Front wing of very variable shape, but generally broad and short; nearly always widest at the base. Costal area always of a more or less triangular form, never band-shaped; the veins never arranged in a regularly pectinate manner on the subcosta, but the main ones always issue radially from one point. The radius, as a rule, sends numerous branches anteriorly or it divides into 2 widely branched, principal offshoots. The media gives off its branches either serially from one stem backward, or it forms 2 compound main branches or (more rarely) the offshoots are directed forward. Cubitus with a very variable number of veinlets branching off posteriorly. Anal area chiefly rather large, its veins never or but quite exceptionally ending in the anal fold, but in the posterior border. The structure is more or less fine-grained leathery, often more cross wrinkled. Regular cross veins as well as borders to the veins were not observed. The body was very broad and flat.

I regard the Mylacridæ, which occur principally in the Middle and Upper Carboniferous formations of North America, as an extremely developed lateral branch of the blattid series, which probably branched off very early, and consequently in many respects has still preserved rather primitive characters; for instance, the structure of the media in the majority of forms. Perhaps they owe their origin to an adaptation to their environment, for it is remarkable how similar many of them are to certain leaves of ferns, with which they are generally found (to which fact Scudder has already called attention). Probably they lived under deciduous fern fronds, and by their similarity to the pinnæ were protected from their enemies.

HEMIMYLACRIS, new genus.

This genus could be almost as well referred to the archimylacrids. The costal area is broad; in one species almost quite triangular; in the others, still somewhat band-shaped; the branches of the subcosta issue in part from one point, in part from the subcosta, so that there is a choice between the two families mentioned. The radius sends 4 branches forward, the first of which separates into 2 or 3 twigs. The 3 offshoots of the media are directed backward to the apical and inner borders, and the 4 or 5 branches of the cubitus do not take up the entire free portion of the posterior margin. The anal area extends over about two-fifths the length of the wing, and is more than twice as long as high. It contains a limited number of compound veins. The form of the wing is subelliptical, about $2\frac{1}{3}$ times as long as broad. No distinct structure.

Type of genus. *Hemimylacris clintoniana* (Scudder).

HEMIMYLACRIS CLINTONIANA (Scudder).

Paromylacris clintoniana SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 53, pl. III, fig. 6.

Locality.—Clinton, Missouri. Cherokee shales; Kittanning (Allegheny) stage.

HEMIMYLACRIS RAMIFICATA, new species.

Locality. Lorberry Gap, in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series; stage ?

Front wing, about 22 mm. long. Subcosta nearly rectilinear, not reaching out much beyond half the length of the wing. Its 3 or 4 branches successively arise near the base. The first branch of the radius separates into 2, the second into 3, and the third into 2 twigs. The 4 branches of the cubitus are compound. Otherwise this species is like the preceding.

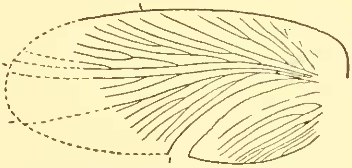


FIG. 69.—HEMIMYLACRIS RAMIFICATA.

Holotype.—Cat. No. 38713, U.S.N.M.

EXOCHOMYLACRIS, new genus.

Front wing scarcely twice as long as broad. The subcosta long, somewhat curved, the costal area therefore not quite triangular, very broad, and reaching almost to the tip of the wing. The first 5 branches of the subcosta arise at the base, but the 3 following ones are given off from the subcosta itself. The radius continues to the middle of the apical border and sends out 4 branches forward, the second of which separates into three twigs. The media runs parallel with the radius to the apical margin, to which it sends 3 branches posteriorly. The cubitus extends obliquely to the lower end of the apical border and gives off 3 furcate and one simple offshoot to the posterior margin. The anal area is fully twice as long as high and nearly half as long as the wing; it contains about 9 veins. Structure not to be distinguished.

In respect to the costal area, this genus likewise forms a transition to the archimylacrids.

EXOCHOMYLACRIS VIRGINIANA, new species.

Locality.—Clendennin, West Virginia. Charleston sandstone.

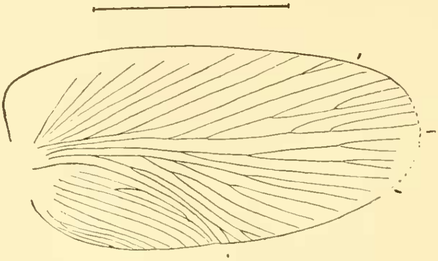


FIG. 70.—EXOCHOMYLACRIS VIRGINIANA.

Length of the front wing, 26 mm.

Holotype.—Cat. No. 25634, U.S.N.M.

ORTHOMYLACRIS, new genus.

Front wing 2 to 2⅓ times as long as broad, of subcordate outline. Costal area extending one-half to two-thirds the length of the wing. Radius continuing to the apical border, with a variously large number of offshoots branching off forward. The superior branch either simple or forked, more rarely strongly compound. Media with few veins directed obliquely backward to the apical and inner borders. Cubitus never continuing to the apical margin, with few branches. Anal area very long, at least twice as long as high, and extending two-fifths to one-half the length of the wing, with numerous more or less compound veins. Structure leathery, more or less distinctly cross wrinkled.

Type of genus, *Orthomylacris analis*, new species.

ORTHOMYLACRIS ANALIS, new species.

Locality.—Port Griffith, Pennsylvania. Anthracite series; E coal (=Freeport stage).

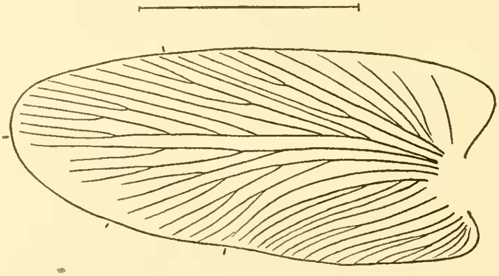


FIG. 71.—ORTHOMYLACRIS ANALIS.

Front wing, 29 mm. long, about 2¼ times as long as wide. Costal area extending two-thirds the length of the wing; its veins united into about 4 bunches. Radius with 7 branches, the first of which is simple, the second 3-parted. Media with 3 (forked) branches. Cubitus turned strongly backward, with 2 forked and one simple branch. Anal area extending nearly half the length of the wing; the first anal vein with several branches running off posteriorly. Structure cross wrinkled.

Holotype.—Cat. No. 38784, U.S.N.M.

ORTHOMYLACRIS RUGULOSA, new species.

Locality.—Lorberry Gap, in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series; stage?

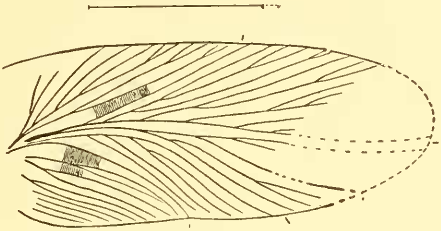


FIG. 72.—ORTHOMYLACRIS RUGULOSA.

Front wing, 26 mm. long, about 2⅓ times as long as broad. Very similar to the foregoing species. Costal area shorter. Anal area only extending two-fifths the length of the wing. Cross veins more distinct.

Holotype.—Cat. No. 38791, U.S.N.M.

ORTHOMYLACRIS TRUNCATULA, new species.

Locality.—Port Griffith, Pennsylvania; Anthracite series; E coal.

Front wing, 23 mm. long, twice as long as wide. Costal area fully two-thirds the wing in length, its veins divided into about 5 bunches.

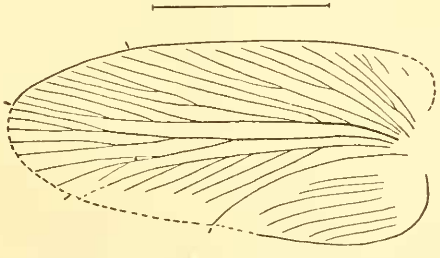


FIG. 73.—ORTHOMYLACRIS TRUNCATULA.

Radius with 6 branches, the first and second of which are simple, the third, 3-parted. Media with 3 compound branches. Cubitus with 5 offshoots. Anal area reaching nearly half the length of the wing. Indistinctly leathery.

Holotype.—Cat. No. 38773, U.S.N.M.

ORTHOMYLACRIS ELONGATA, new species.

Locality.—Lorberry Gap, in Sharp Mountain, 5 miles west of Tremont, Pennsylvania. Anthracite series; stage?

Front wing, 26 mm. long, $2\frac{2}{5}$ times as long as broad. Costal area reaching about five-eighths the length of the wing, its veins united into 3 or 4 bunches. Radius with 6 branches, the first simple, the second with 5 twigs, and the third with 3. Media with about 3 branches, cubitus with 4. Anal area extending two-fifths the length of the wing. Finely crinkled cross veins.

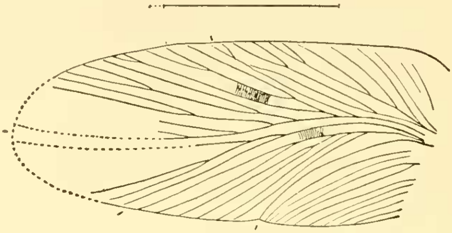


FIG. 74.—ORTHOMYLACRIS ELONGATA.

Holotype.—Cat. No. 25687, U.S.N.M.

ORTHOMYLACRIS MANSFIELDI (Scudder).

Mylacris mansfieldi SCUDDER, Mem. Boston Soc., III, 1879, p. 47, pl. v, fig. 15.

Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group; roof of the Middle Kittanning coal.

ORTHOMYLACRIS LUCIFUGA (Scudder).

Mylacris lucifuga SCUDDER, Mem. Boston Soc., III, 1884, p. 301, pl. XXVII, fig. 8.

Locality.—Port Griffith Switchback, near Pittston, Pennsylvania. Anthracite series; ? D coal.

Holotype.—Cat. No. 38054. U.S.N.M.

ORTHOMYLACRIS HEERI (Scudder).

Blattina heeri SCUDDER, Canad. Nat., VII, 1874, p. 272, fig. 2.

Mylacris heeri SCUDDER, Mem. Boston Soc., III, 1879, p. 43, pl. v, fig. 11.

Locality.—Sydney, Cape Breton. Middle coal formation; Allegheny stage?

ORTHOMYLACRIS ALUTACEA, new species.

Locality.—Port Griffith Switchback, Pennsylvania. Anthracite series; ? D coal.

Front wing, 30 mm. long; 2¼ times as long as broad. Costal area extending nearly three-fourths the length of the wing. Radius with 4 branches, which form short terminal forks. Media with 3 offshoots. Cubitus with 4 branches. Anal area extending nearly half the length of the wing. Fine-grained leathery structure.

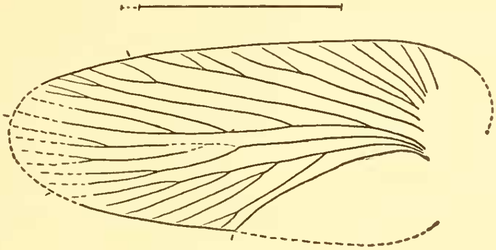


Fig. 75.—Orthomylacris alutacea.

Holotype.—Cat. No. 38772, U.S.N.M.

ORTHOMYLACRIS PLUTEUS (Scudder).

Paromylacris ? pluteus Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 54, pl. iii, fig. 2.

Locality.—Butler Mine, near Pittston, Pennsylvania. Anthracite series; E. coal.

Holotype.—Cat. No. 38048, U.S.N.M.

ORTHOMYLACRIS ANTIQUA (Scudder).

Mylacris antiqua Scudder, Mem. Boston Soc., III, 1884, p. 300; Bull. U. S. Geol. Surv., No. 124, 1895, p. 46, pl. ii, figs. 5, 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38050, U.S.N.M.

ORTHOMYLACRIS PENNSYLVANICA, new species.

Locality.—Lorbery Gap, in Sharp Mountain, 5 miles west of Tremont, Pennsylvania. Anthracite series; stage ?

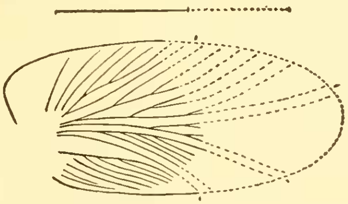


Fig. 76.—Orthomylacris pennsylvanica

Fragment, about 32 mm. long, of a front wing, costal area extending two-thirds the length of the wing. Radius with about 3 branches, the first of which divides into 3 twigs; the second is furcate. Media with few forked branches. Cubitus with 4 branches. Anal area long, reaching nearly half the length of the wing. The first anal vein sends out several twigs backward. Structure leathery, with a tendency to the formation of cross wrinkles.

Holotype.—Cat. No. 38748, U.S.N.M.

ANOMOMYLACRIS, new genus.

Front wing slenderly cordate, nearly 2½ times as long as the basal width. Costal area triangular, half as long as the wing, with about 7 veins issuing radially from the base. Radius with 5 branches directed toward the anterior margin, only the first and third of which are furcate. Media continuing in a nearly straight course through the middle of the wing, with 2 forked branches which run off backward and extend to the apical border. Between the radius and the media lies an accessory vein. The cubitus is greatly developed and proceeds in a nearly straight horizontal line from the base to the apical margin; its first (proximal) is forked, the second divides into 4 or 5 twigs, the third is simple, the fourth is furcate, and the fifth is again simple. The anal area is 2½ times as long as high and nearly half as long as the wing. The first anal vein sends 4 twigs backward; then follow about 8 to 9 veins. The structure consists of a fine, close network.

ANOMOMYLACRIS CUBITALIS, new species.

Locality.—Lorberry Gap, in Sharp Mountain, 5 miles west of Tremont, Pennsylvania. Anthracite series; stage ?

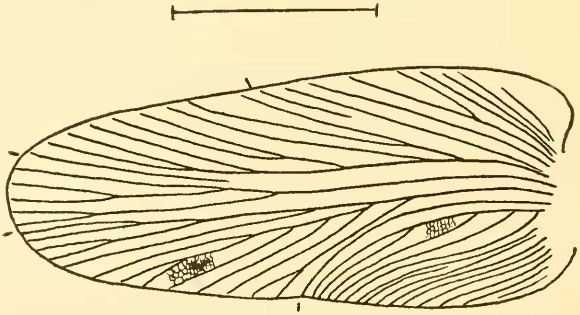


FIG. 77.—ANOMOMYLACRIS CUBITALIS.

Length of front wing, 27 mm.

Holotype.—Cat. No. 38747, U.S.N.M.

STENOMYLACRIS, new genus.

Front wing very slender, 2¾ times as long as broad. Costal area triangular, not quite reaching the middle of the wing, the veins arising from the subcosta near the base. Radius stretching in a strong vault to the tip of the wing, its first branch twice forked, the second simple, the third, fourth, and fifth furcate, and the last simple. The media proceeds obliquely to the end of the apical border and sends out 1 forked and 1 simple branch obliquely backward to the extremity of the inner margin, besides 1 simple and 2 forked offshoots forward to the apical border. The strongly arcuate cubitus, with its 4 furcate or simple branches, occupies the central portion of the inner margin. The anal area is more than twice as long as high and takes up about three-sevenths the length of the wing; it contains about 8 to 9 veins. Structure leathery.

STENOMYLACRIS ELEGANS, new species.

Locality.—Sharp Mountain Gap, mammoth vein, 2 miles south of Tremont, Pennsylvania. Anthracite series; stage ?

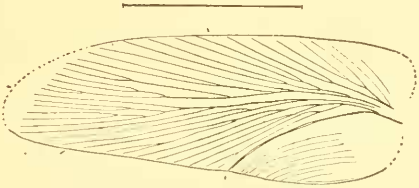


Fig. 78.—Stenomylacris elegans.

Length of the front wing, 25 mm.

Holotype.—Cat. No. 38738, U.S.N.M.

ACTINOMYLACRIS, new genus.

Front wing cordate, twice as long as broad. Costal area short, triangular, not extending beyond half the length of the wing; the veins nearly all issue from the base. Radius with 5 to 6 branches, the first of which separates into 3 or 4 twigs. Media with 3 to 4 offshoots directed backward to the apical and posterior borders. Cubitus with 1 furcate and 2 simple branches. The anal area is shorter than in the preceding genera, less than twice as long as high, and contains a large number (about 10 to 14) of veins. Structure leathery.

Type of genus, *Actinomylacris carbonum* (Scudder).

ACTINOMYLACRIS CARBONUM (Scudder).

Mylacris carbonum Scudder, Mem. Boston Soc., III, 1885, p. 304, pl. xxvii, fig. 10 (not figs. 6 and 7).

Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group; roof of the Middle Kittanning coal.

ACTINOMYLACRIS VICINA, new species.

Locality.—Tremont, Pennsylvania. (Buck Mountain.) Anthracite series; mammoth coal; stage ?

Length of the front wing, 21 mm. The first branch of the radius with 4 twigs, the second branch furcate, the 4 following offshoots simple. Media with 4 branches. Structure leathery, with a tendency to the formation of cross wrinkles.

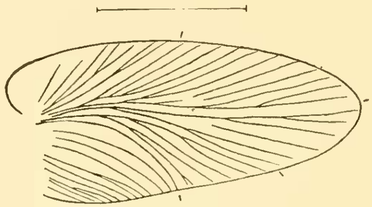


Fig. 79.—Actinomylacris vicina.

Holotype.—Cat. No. 38750, U.S.N.M.

PHTHINOMYLACRIS, new genus.

Front wing cordate, scarcely twice as long as wide, with especially strongly developed costal area, which extends about five-sevenths the length of the wing, and whose bunches of veins emerge ray-like from one point. The radius is more strongly developed and occupies nearly the entire apical margin. Of its branches, the first separates into 2 or 3 twigs, while those following chiefly remain simple. The media is very much reduced and sends out but 2 short simple offshoots posteriorly toward the end of the inner border. The cubitus is also strongly reduced and forms only 3 to 4 branches. The anal area is consequently very large, more than half as long as the entire wing and more than twice as long as high. The structure can not be made out.

Type of genus, *Phthinomylacris cordiformis*, new species.

PHTHINOMYLACRIS CORDIFORMIS, new species.

Locality.—Port Griffith, Pennsylvania. Anthracite series; E coal.

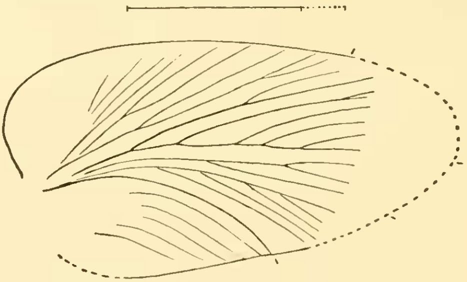


Fig. 80.—Phthinomylacris cordiformis.

Length of the front wing, 28 mm. First branch of the radius furcate. Cubitus with 4 simple branches.

Holotype.—Cat. No. 38770, U.S.N.M.

PHTHINOMYLACRIS MEDIALIS, new species.

Locality.—Port Griffith, Pennsylvania. Anthracite series; E coal. Length of the front wing, 25 mm. First branch of the radius divides into 3 twigs. Cubitus with 3 forked offshoots. Anal area with 10 parallel veins.

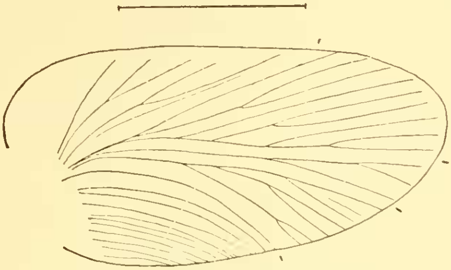


FIG. 81.—PHTHINOMYLACRIS MEDIALIS.

Holotype.—Cat. No. 38765, U.S.N.M.

CHALEPOMYLACRIS, new genus.

Front wing of more elliptical or kidney-shaped outline, $2\frac{1}{3}$ times as long as broad, with the costal area not very much widened at the base and reaching not quite half the length of the wing; its veins all issue from the subcosta near the base. Just at the base of the wing, the radius divides into 2 main branches, each of which by repeated division separates into 7 or 8 branchlets, which take up nearly the entire anterior margin. The media also divides into 2 principal members, the superior of which, with its 5 twigs, occupies the apical border, and the inferior, with its 6 veinlets directed backward, takes up the terminal third of the inner margin. The feebly developed cubitus, with its 2 forked and 1 simple branches, occupies only a small portion of the posterior border. The anal area is more than twice as long as high, and extends over about three-sevenths of the inner margin; it contains only 6 or 7 veins. The structure is fine-grained leathery, without cross veins.

CHALEPOMYLACRIS PULCHRA, new species.

Locality.—Sharp Mountain Gap, 2 miles south of Tremont, Pennsylvania. Anthracite series; stage ?

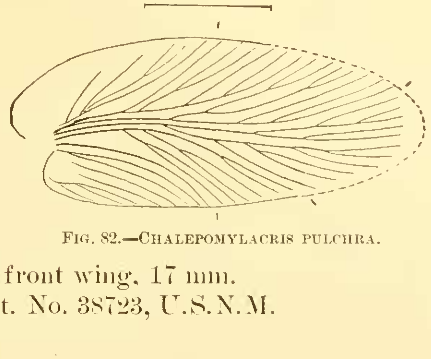


FIG. 82.—CHALEPOMYLACRIS PULCHRA.

Length of the front wing, 17 mm.

Holotype.—Cat. No. 38723, U.S.N.M.

BRACHYMYLACRIS, new genus.

Front wing broadly cordate, $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as broad. Costal area wide, more or less triangular to lancet shaped, extending three-fifths to two-thirds the length of the wing; its veins are united into bunches, which issue from the base. Radius with 3 to 7 offshoots branching off in various ways to the anterior border. Media always divided into 2 equally branched principal members. Cubitus with 3 to 7 branches, never reaching the apical margin. Anal area always less than twice as long as high and less than half as long as the wing. Structure fine-grained, leathery, cross wrinkled.

Type of genus, *Brachymylacris elongata*, new species.

BRACHYMYLACRIS ELONGATA, new species.

Locality.—Tremont, Pennsylvania. Anthracite series; stage ?

Front wing, 16 mm. long. Radius with 4 branches, of which the first and third always have three twigs, the second is furcate, and the fourth simple. The superior branch of the media is divided into 6 offshoots; the inferior into 4 twigs. Anal area with 9 regular veins. Costal area with 8 veins, which form 3 groups.

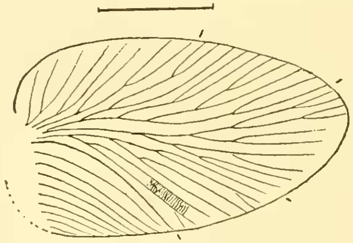


FIG. 83.—BRACHYMYLACRIS ELONGATA.

Holotype.—Cat. No. 38753, U.S.N.M.

BRACHYMYLACRIS CORDATA, new species.

Locality.—Tremont, Pennsylvania. Anthracite series; stage ?

Front wing, 14 mm. long. Radius with 3 branches, of which the first forms 4 and the second 2 twigs. Media with 2 furcate, main branches. Cubitus with 3 offshoots, the first of which is twice forked; the second, furcate. Anal area with 9 in part compound veins. Costal area with 13 branches divided into 7 groups.

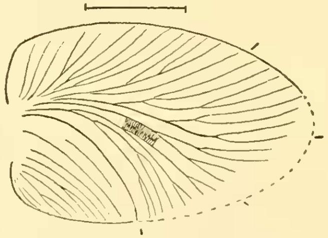


FIG. 84.—BRACHYMYLACRIS CORDATA.

Holotype.—Cat. No. 38752, U.S.N.M.

BRACHYMYLACRIS ROTUNDATA, new species.

Locality.—Sharp Mountain Gap, 2 miles south of Tremont, Pennsylvania. Anthracite series; stage ?

Length of the front wing, 14 mm. Radius with 7 branches, the first of which forms 3 twigs, while the second and third are furcate, and the following ones simple. Each main branch of the media forms 3 twigs. Cubitus with about 8 offshoots, some of which are divided. The apical border of the wing is remarkably broadly rounded; the costal area contains about 12 veins, which are united into about 4 groups.

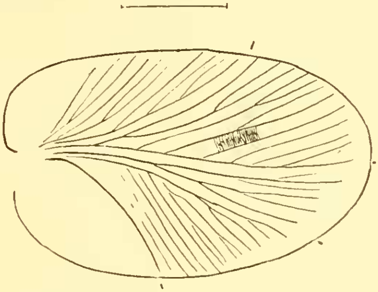


Fig. 85.—Brachymylacris rotundata.

Holotype.—Cat. No. 38727, U.S.N.M.

BRACHYMYLACRIS MIXTA, new species.

Locality.—Sharp Mountain Gap, 2 miles south of Tremont, Pennsylvania. Anthracite series; stage ?

Length of the front wing, 14 mm. Radius with 4 branches, the first of which forms 4 twigs and the second 3 offshoots. The superior branch of the media with 3 veinlets, the inferior with 4. Cubitus with one simple and 3 furcate branches. Apical border broadly rounded.

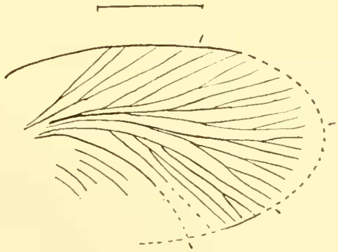


Fig. 86.—Brachymylacris mixta.

Holotype.—Cat. No. 38736, U.S.N.M.

GONIOMYLACRIS, new genus.

A provisional genus founded on the basal portion of a mylacrid wing, which is distinguished by a strong curve of the subcosta, with the convexity directed anteriorly. The majority of the branches of this vein issue from the base; 3 from the vein itself. The costal area attains at least two-thirds the length of the wing. The radius appears to have had only 3 simple branches. The media separates into 2 main stems, with probably always 3 or 4 twigs. The cubitus also appears to have had but 3 to 4 offshoots. Anal area long and narrow, probably reaching half the length of the wing. Humeral angle very strongly produced. No structure to be seen.

GONIOMYLACRIS PAUPER, new species.

Locality.—Sharp Mountain Gap, 2 miles south of Tremont, Pennsylvania. Anthracite series; stage ?

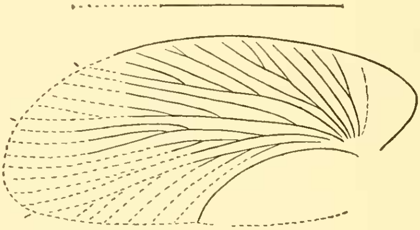


FIG. 87.—GONIOMYLACRIS PAUPER.

Probable length of the wing, 32 mm.
Holotype.—Cat. No. 38728, U.S.N.M.

MYLACRIS Scudder.

Mylacris anthracophila Scudder is to be regarded as the type of this genus.

Front wing 2 to 2⅓ times as long as broad, with more strongly arched anterior margin and more slightly curved inner margin. Costal area wide, triangular, reaching three-fifths to two-thirds the length of the wing, with ray-like veins issuing from the base. Radius continuing to the tip of the wing, with 5 to 6 simple or furcate branches. Media stretching obliquely to the extremity of the posterior margin, with 3 to 4 offshoots branching forward and directed toward the apical margin. Cubitus with 4 to 6 more or less branched members. Anal area more than twice as long as high, almost half as long as the inner margin of the wing, and with about 7 to 8 in part branched veins. No distinct structure to be seen.

Prothorax much broader than long.

MYLACRIS ANTHRACOPHILA Scudder.

Mylacris anthracophila SCUDDER, Geol. Surv. Illinois, III, 1868, p. 568, figs. 5, 6; Mem. Boston Soc., III, 1879, p. 45, pl. v, figs. 6 to 8; Bull. U. S. Geol. Surv., No. 124, 1895, p. 43, pl. I, figs. 1, 4.

Locality.—Colchester, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

MYLACRIS ELONGATA Scudder.

Mylacris elongata SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 41, pl. I, fig. 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38049. U.S.N.M.

? MYLACRIS SELLARDSII, new species.

Mylacris elongata SELLARDS (not Scudder), Amer. Jour. Sci. (4), XVIII, 1904, p. 125, fig. 8, pl. I, fig. 1.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

I am not convinced that the specimens investigated by Sellards belong to Scudder's *Mylacris elongata*. They appear to be larger and to have more copiously branched veins. The larvæ mentioned by Sellards I shall discuss separately.

MYLACRIS SIMILIS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

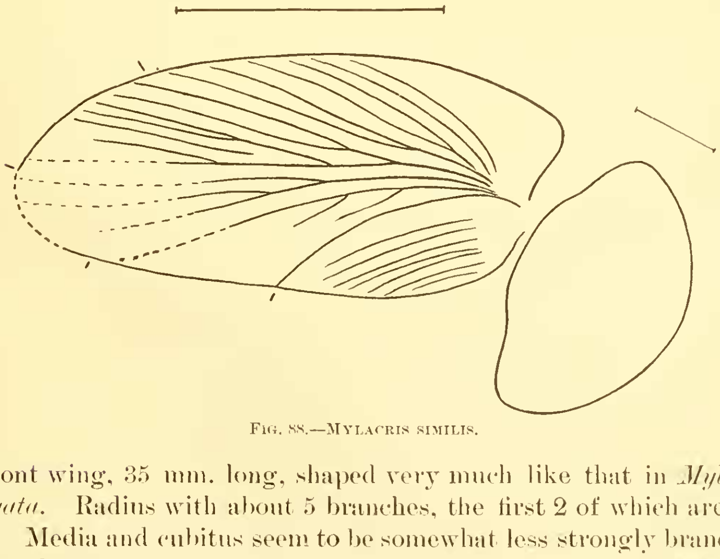


FIG. 88.—MYLACRIS SIMILIS.

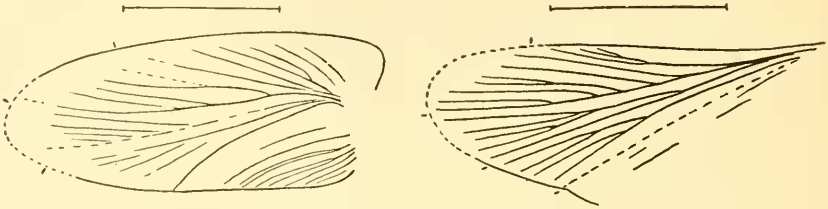
Front wing, 35 mm. long, shaped very much like that in *Mylacris elongata*. Radius with about 5 branches, the first 2 of which are furcate. Media and cubitus seem to be somewhat less strongly branched.

Daniels collection. Reverse of holotype in the U. S. National Museum: Cat. No. 35573.

? MYLACRIS DUBIA, new species.

Locality.—Lorberry Gap, 5 miles west of Tremont, Pennsylvania. Anthracite series; stage?

Front wing, about 25 mm. long, 2⅓ times as long as broad. The venation is very indistinctly preserved, but as far as known agrees with that of the foregoing species. The anal area is also as long as in that form.



FIGS. 89, 90.—? MYLACRIS DUBIA.

The hind wing shows an anal area marked off by a fold, and extends about two-thirds the length of the wing. The radius sends 5 branches forward toward the tip of the wing; the media gives off 3 offshoots posteriorly, and the cubitus forms a double fork.

Cotypes.—Cat. No. 38746, U.S.N.M.

? APHELOMYLACRIS, new genus.

A provisional genus founded on an imperfectly preserved form, the venation of which appears to have great similarity to that of *Mylacris.* The front wing is cordate, twice as long as broad. The triangular costal area hardly extends beyond half the length of the wing, and contains but few veins. The radius forms 5 branches, the first 3 of which are furcate. The media appears to send out only 2 branches anteriorly; still this part of the wing is here indistinctly preserved. The cubitus forms about 8 uniform, simple branches. Anal area less than half as long as high. Traces of cross wrinkles are distinctly to be seen.

? APHELOMYLACRIS MODESTA, new species.

Locality.—Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

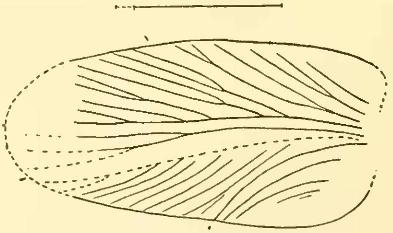


FIG. 91.—? APHELOMYLACRIS MODESTA.

Front wing, about 22 mm. long.

Holotype.—Cat. No. 38702, U.S.N.M.

LITHOMYLACRIS Scudder.

Front wing slender, almost lancet shaped, 3 times as long as broad. Costal area triangular, extending two-thirds the length of the wing, with veins issuing radially from one point. Radius continuing almost horizontally through the middle of the wing, with 6 branches, the second and third of which are furcate. Media stretching obliquely to the extremity of the inner margin, with 2 forked and one simple branches running out forward. Cubitus advancing obliquely to the inner margin, with one simple and 2 furcate branches. Anal area proportionally small, more than twice as long as high, and occupying only two-fifths of the posterior margin.

LITHOMYLACRIS ANGUSTA Scudder.

Lithomylacris angusta Scudder, Mem. Boston Soc., III, 1879, p. 48, pl. v, fig. 2.

Locality.—Port Griffith Switchback, near Pittston, Pennsylvania. Anthracite series; E coal.

Holotype.—Cat. No. 38094, U.S.N.M.

SPHENOMYLACRIS, new genus.

Front wing subcordate, with slightly curved anterior margin, and more strongly arcuate inner border, not quite twice as long as broad at the base. Costal area fully three-fifths of the length of the wing in extent, with several bunches of veins issuing from the base. Radius with 3 forked and one simple branches, the first 2 of which spring from one point. The last branches end in the apical margin. Media divided into 2 furcate offshoots. Cubitus strongly vaulted and, with its 3 forked and 2 simple veins, taking up the central portion of the posterior margin. Anal area not quite twice as long as high, extending three-sevenths the length of the wing, and limited by a quite straight fold, in which the first anal vein fuses; the 6 remaining anal veins are somewhat curved, and with their extremities turned toward the tip of the wing; they end, however, in the normal way in the inner margin. The structure consists of fine, indistinct, irregular cross lines. The humeral angle is broadly rounded, not produced into an angle.

SPHENOMYLACRIS SINGULARIS, new species.

Locality.—Port Griffith Switchback, near Pittston, Pennsylvania. Anthracite series; E coal.

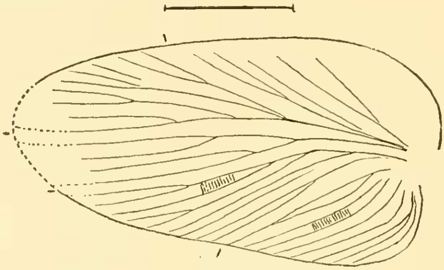


FIG. 92.—SPHENOMYLACRIS SINGULARIS.

Length of the front wing, 20 mm.

Holotype.—Cat. No. 38761, U.S.N.M.

AMBLYMYLACRIS, new genus.

Front wing twice as long as broad, of nearly kidney-shaped form, with strongly arcuate front margin and very broadly rounded apical border. Humeral angle rounded, not produced into an angle. Costal area triangular, broad, with bunches of veins issuing radially from one point. Radius greatly developed, arcuate, and continuing to the apical margin, with 6 to 8 more or less branched, pectinately arranged offshoots. Media reduced, with but 2 to 3 branches directed forward toward the apical border. Cubitus with about 5 more or less compound offshoots occupying the entire free inner margin. Anal area defined by a curved vein, not quite twice as long as high and taking up less than half the inner margin. Anal veins normally curved to the inner border.

Type of genus, *Amblymylacris clintoniana* (Scudder).

AMBLYMYLACRIS CLINTONIANA (Scudder).

Etoblattina clintoniana SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 66, pl. IV, fig. 1.

Locality.—Clinton, Missouri. Cherokee shales; Kittanning (Allegheny) stage.

AMBLYMYLACRIS HAREI (Scudder).

Promylacris harei SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 48, pl. II, fig. 3.

Locality.—Kansas City, Missouri. Chanute shales; Conemaugh ? stage.

PROMYLACRIS Scudder.

A somewhat indefinite genus, the type of which may be regarded as *Promylacris ovalis* Scudder. Front wing probably cordate, with strongly arcuate anterior margin and rounded humeral angle; about 2⅓ times as long as broad. Costal area almost triangular, continuing somewhat beyond half the length of the wing, with 3 bunches of veins issuing from one point, the first of which shows about 6 twigs. The radius is quite distinctively formed, in that from one point not far from the base 4 ray-like branches run off successively; the first, second, and fourth of these branches always consist of 3 to 4 branchlets, while the third remains simple. According to the figure it may be concluded that the branches of the radius scarcely fill up the entire free anterior margin. The media forms about 3 or 4 offshoots, which are directed forward toward the apical border; and the cubitus about 5 branches, which in each case fill the entire free posterior margin. The anal area is about twice as long as high and half as long as the inner margin, and contains regular veins fusing in the posterior border.

PROMYLACRIS OVALIS Scudder.

Promylacris ovalis SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 34; Mem. Boston Soc., IV, 1890, p. 403, pl. XXXI, figs. 1 to 4.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

MYLACRIDÆ OF DOUBTFUL SYSTEMATIC POSITION.

PAROMYLACRIS ROTUNDA Scudder.

Paromylacris rotunda SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 35; Mem. Boston Soc., IV, 1890, p. 406, pl. XXXII, figs. 1, 2.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

This species is to be regarded as the type of the genus *Paromylacris*.

Holotype.—Cat. No. 38047, U.S.N.M.

(MYLACRIDÆ) PRISCOVOLANS (Scudder).

Mylacris priscovolans SCUDDER, Mem. Boston Soc., III, 1884, p. 307, pl. XXVII, fig. 9.

Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group; roof of the Middle Kittanning coal.

Cotypes.—Cat. No. 38055; U.S.N.M.

(MYLACRIDÆ) PAUPERATA (Scudder).

Lithomylacris pauperata SCUDDER, Mem. Boston Soc., IV, 1890, p. 409, pl. XXXII, fig. 5.

Locality.—Port Griffith, Pennsylvania. Anthracite series; E coal.

Holotype.—Cat. No. 38095, U.S.N.M.

(MYLACRIDÆ) PSEUDO-CARBONUM, new species.

Mylacris carbonum Scudder (part), Mem. Boston Soc., III, 1884, p. 304, pl. XXVII, fig. 6 (not fig. 7, 10).

Locality.—Cannelton, Pennsylvania. Allegheny formation: Kittanning group: roof of the Middle Kittanning coal.

Holotype.—Cat. No. 38900, U.S.N.M.

(MYLACRIDÆ) CARBONINA, new species.

Mylacris carbonum Scudder (part), Mem. Boston Soc., III, 1884, p. 304, pl. XXVII, fig. 7 (not fig. 6, 10).

Locality.—Empire Mine, Wilkes-Barre, Pennsylvania. Anthracite series; E coal.

Holotype.—Cat. No. 38052, U.S.N.M.

(MYLACRIDÆ) BRETONENSIS (Scudder).

Blattina bretonensis Scudder, Canad. Nat., VII, 1874, p. 271, fig. 1.

Mylacris bretonensis Scudder, Mem. Boston Soc., III, 1879, p. 41, pl. V, fig. 1.

Locality.—Sydney, Cape Breton. Middle Coal formation: Allegheny stage?

(MYLACRIDÆ) SIMPLEX (Scudder).

Lithomylacris simplex Scudder, Mem. Boston Soc., III, 1879, p. 51, pl. V, fig. 5.

Locality.—Danville, Illinois. Pennsylvanian; Conemaugh (or Freeport ?) stage.

(MYLACRIDÆ) PITTSTONIANA (Scudder).

Lithomylacris pittstoniana Scudder, Mem. Boston Soc., III, 1879, p. 50, pl. V, figs. 4, 10.

Locality.—Port Griffith, Pennsylvania. Anthracite series; E coal.

Holotype.—Cat. No. 38096, U.S.N.M.

(MYLACRIDÆ) PENNSYLVANICA (Scudder).

Mylacris pennsylvanica Scudder, Mem. Boston Soc., III, 1879, p. 44, pl. V, figs. 13, 14.

Locality.—Cannelton, Pennsylvania. Allegheny formation: Kittanning group; roof of the Middle Kittanning coal.

Cotypes.—Cat. No. 38102, U.S.N.M.

(MYLACRIDÆ) AMPLA (Scudder).

Mylacris ampla Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 45, pl. II, fig. 1.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38051, U.S.N.M.

(MYLACRIDÆ) GURLEYI (Scudder).

Mylacris gurleyi Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 43, pl. I, fig. 5.

Locality. Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

(MYLACRIDÆ) RIGIDA (Scudder).

Promylacris rigida Scudder, Mem. Boston Soc., IV, 1890, p. 403, pl. XXXI, fig. 6.
Promylacris rigida Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 221, fig. 36.

Locality. Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype. Cat. No. 38045, U.S.N.M.

(MYLACRIDÆ) AMPLA (Scudder).

Paromylacris ampla Scudder, Mem. Boston Soc., IV, 1890, p. 408, pl. XXXI, fig. 7; Bull. U. S. Geol. Surv., No. 124, 1895, p. 51, pl. III, fig. 4.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38044, U.S.N.M.

Family DICTYOMYLACRIDÆ, new family.

In this group I unite several forms from the European and American Carboniferous, which, in the form of the costal area, recall the archimylacrids on the one hand and the mylacrids on the other. The costal area is here of almost triangular form, while most of the branches arise successively from the subcosta. The branches of the radius are directed obliquely forward; those of the media, on the contrary, slope backward. The cubitus occupies only a limited space, and the anal area is marked off by a curved suture, in which part of the anal veins end. The longitudinal veins are connected by distinct, remote cross veins. In the European forms the prothorax is very broad, transversely elliptical, and is characterized by ribs which run off radially to the periphery.

DICTYOMYLACRIS Brongniart.

Front wing somewhat more than twice as long as broad, subcordate, with strongly arched anterior margin, costal area occupying from four-sevenths to two-thirds the length of the wing, with from 5 to 7 veins arising successively from the subcosta and several feebly branched ones proceeding from the base.

DICTYOMYLACRIS MULTINERVIS (Sellards).

"*Undescribed Blattinariæ*" SELLARDS, Amer. Jour. Sci. (4), XV, 1903, p. 312, pl. VII, fig. 6.

Schizoblattina multinervia SELLARDS, Amer. Jour. Sci. (4), XVIII, 1904, p. 217 fig. 28.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

This form, described by Sellards, agrees completely with the genus *Dictyomylacris* Brongniart, founded on European forms, represented in the Stephanian of Commentry by several species. The erection of a new genus, therefore, I consider unnecessary.

Family NEOMYLACRIDÆ, new family.

This group appears to be nearly related to the dictyomylacrids and agrees with the latter to the extent that here also the first anal veins end in the suture of the anal area. The costal area is short and triangular, the subcosta not curving backward with the convexity, but forward; all its veins issue from the subcosta near the base. The humeral angle is not strongly produced, but rounded. Radius normal. Branches of the media directed backward. Cubitus normal. Anal area rather long and limited by a curved suture. Hitherto several species were made known from the upper portion of the Upper Carboniferous of America.

NEOMYLACRIS, new genus.

Front wing cordate about twice as long as wide. Costal area reaching from three-fifths to two-thirds the length of the wing, with only from 5 to 6 veins. Radius with 5 or 6 simple or furcate branches successively running out forward; part of these occupy the free portion of the anterior margin and part the apical border. Media with 2 ? to 4 branches diverging posteriorly. Cubitus with a small number of offshoots occupying almost the entire free inner margin. Costal area about twice as long as high, extending from two-fifths to nearly one-half the length of the wing, and limited by a curved suture; the first anal vein ends in the suture. Structure indistinct, either stippled like leather or with a tendency to the formation of cross wrinkles.

Type of genus, *Neomylacris major*, new species.

NEOMYLACRIS MAJOR, new species.

Locality.—Port Griffith Switchback, Pennsylvania. Anthracite series; E coal.

Length of the front wing, 22 mm. First, second, and fifth branches of the radius simple; third and fourth branches furcate. Media with 4 offshoots, the first of which originates at one-third the length of the wing. Anal area with about 10 veins. No definite structure to be seen.

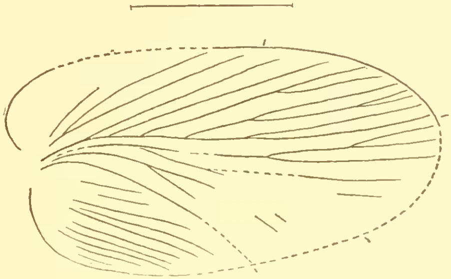
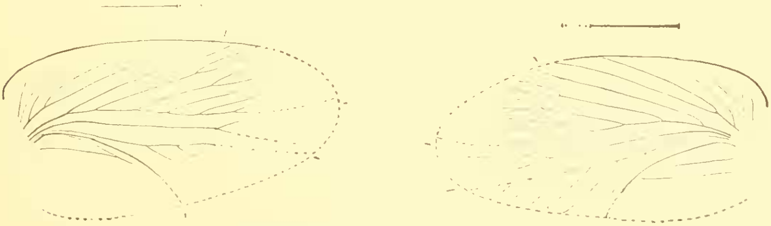


FIG. 93.—NEOMYLACRIS MAJOR.

Holotype.—Cat. No. 38766, U.S.N.M.

NEOMYLACRIS PULLA, new species.

Locality.—Lorberry Gap in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series; stage?



FIGS. 94 and 95.—NEOMYLACRIS PULLA.

Length of front wing, 16 mm. Radius with 6 branches, the second and third of which are forked. Media first divides in the last third of the length of the wing.

Cotypes.—Cat. Nos. 25476 and 38794, U.S.N.M.

NEOMYLACRIS PAUCINERVIS, new species.

Locality.—Lorberry Gap in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series; stage?

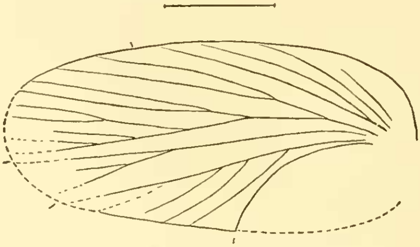


FIG. 96.—NEOMYLACRIS PAUCINERVIS.

Length of front wing, 16 mm. Very similar to the previous species. Radius with 3 furcate and 2 simple branches. Media first furcates in the last third of the length of the wing.

Holotype.—Cat. No. 38789, U.S.N.M.

Family PTERIDOMYLACRIDÆ, new family.

I erect this family on an aberrant blattoid form, whose heart-shaped wing, in respect to the shape of the costal area, conforms to that of the mylacrids; in its enormously lengthened anal area, which attains about four-fifths the length of the wing, however, it widely differs from all other blattid forms. The radius is developed in the normal way; the media and the cubitus, on the contrary, are much reduced. The veins of the anal area end in the inner border.

Indeed, no other blattid wing shows so striking a resemblance to the pinnæ of a fossil fern, and I was for a long time in doubt whether the present specimen should really be regarded as the remains of an insect or as a plant. We here seem to have a form showing an extreme adaptation.

PTERIDOMYLACRIS, new genus.

Front wing cordate, 1¾ times as long as broad. Costal area triangular, attaining nearly two-thirds the length of the wing, with ray-like veins issuing from one point. Radius advancing to the apical border, with about 7 regular branches, probably simple throughout, extending to the anterior margin. Media arcuate, with one short terminal fork. Cubitus with one compound and one simple branch, which strike the end of the inner margin. Anal area strongly developed, reaching four-fifths the length of the wing, and marked off by a curved suture, with 10 veins ending in the posterior margin, several of which have a common origin. No structure to be seen.

PTERIDOMYLACRIS PARADOXA, new species.

Locality.—Lorberry Gap in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series: stage ?

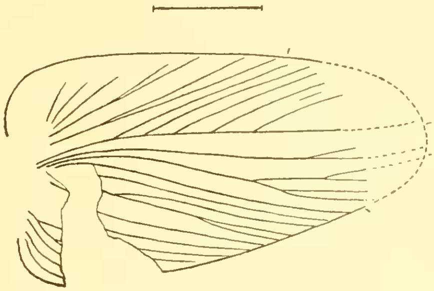


FIG. 97.—PTERIDOMYLACRIS PARADOXA.

Length of the front wing, about 18 mm.

Holotype.—Cat. No. 38733, U.S.N.M.

Family IDIOMYLACRIDÆ, new family.

For the type of this family, I take a highly specialized blattoid wing, which in the shape of the costal area agrees with the mylacrid series, but which appears to be distinguished by the unique disposition of the anal veins. The front wing is subelliptical, scarcely twice as long as broad, with strongly curved inner margin and gently curved anterior border. Costal area one-half as long as the wing, subtriangular, broad; humeral angle rounded. The branches of the subcosta arise at the base of the wing. Radius divided near the base into 2 main offshoots, each of which forms about 3 branchlets. The twigs of the superior branch end on the anterior border; those of the inferior, on the contrary, on the apical margin. The media likewise separates into 2 branches similar to those of the radius, the twigs of which (always 3) take up the last third of the inner margin. The cubitus with its 3 branches is limited to the middle portion of the posterior margin. The anal area occupies not much more than one-third the length of the wing, and is defined by a strongly curved suture. The anal veins are quite uniquely grouped, since from one stem 3 offshoots branch forward and 1 backward. The first branch ends in the second, the second in the third, and this, as well as those following, end in the inner margin. Structure finely stippled, like leather.

IDIOMYLACRIS, new genus.

IDIOMYLACRIS GRACILIS, new species.

Locality.—Lorberry Gap in Sharp Mountain, near Tremont, Pennsylvania. Anthracite series; stage ?

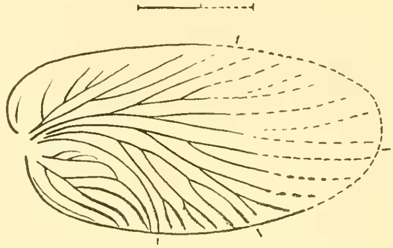


FIG. 98.—IDIOMYLACRIS GRACILIS.

Length of the front wing, about 15 mm.
Holotype.—Cat. No. 38793, U.S.N.M.

Family NEORTHROBLATTINIDÆ, new family.

I establish this family on a somewhat aberrant blattoid form, which unfortunately I can judge only from Scudder's figure and discription. The venation somewhat recalls that of *Idiomylacris* from the Upper Carboniferous and permits itself very easily to be derived from the archimylacrid type. The outline of the wing appears to have been subreniform, with somewhat broadened base, and rather more than twice as long as wide. The short, broad costal area reaches over a little beyond the middle of the wing, and the form belongs to the band-shaped type (Archimylacridæ, etc.); the veins issue successively from the subcosta. The radius extends to the upper end of the apical border and sends out only a small number of branches toward the front margin. About in the middle of the wing, the media divides into 2 simple or furcate branches. The cubitus continues to the end of the posterior border and sends out several branches to it. The anal area is large, marked off by a bow-shaped fold, and contains a small number of veins, which branch off in a peculiar manner, similar to that in *Idiomylacris*, in part again uniting; they all end in the inner margin. On the impression, the surface of the wing appears very opaque; the veins, on the contrary, are preserved as thin broad stripes.

NEORTHROBLATTINA Scudder.

NEORTHROBLATTINA ALBOLINEATA Scudder.

Neorthroblattina albolineata SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 109; Mem. Boston Soc., IV, 1890, p. 467, pl. XLII, fig. 2 (? 18).

Locality.—Fairplay, Colorado. Lower Permian.

Family POROBLATTINIDÆ, new family.

This family is founded on a number of small forms from the Uppermost Carboniferous and Lower Permian. These forms constitute a link between the archimylacrids and the prevailing Mesozoic mesoblattinids, and are characterized by a strongly reduced costal area, which extends only from one-third to one-half the length of the wing and is of rather narrow lancet-like shape. In contrast with the mesoblattinids, however, the few branches of the subcosta are still distinctly developed, and arise from the subcosta serially as in the archimylacrids. The radius very gradually takes the place of the subcosta and forms numerous simple or feebly divided branches directed forward. The media is free and sends out a small number of offshoots forward to the apical border; the cubitus gives off a variably large number of branches backward; rarely, also, one forward. The anal area is relatively large, limited by a strongly curved suture, and contains numerous veins, of which the first ones only end in the suture; all others, on the contrary, end in the inner border. No distinct cross veins.

POROBLATTINA Scudder.

Poroblattina arcuata Scudder is to be regarded as the type of this genus.

Front wing subelliptical, $1\frac{3}{4}$ to 2 times as long as broad. Radius very strongly arcuate, curving down to the middle of the wing and recurving to the apical border. Media first divides below the middle of the wing. Cubitus with few branches and not occupying the entire free posterior border, strongly vaulted. Anal area half as long as the wing and less than twice as long as high, with numerous oblique veins directed toward the apex of the area, the larger number of which end in the inner border. No structure to be seen (many oblique cross folds between the veins).

POROBLATTINA BRACHYPTERA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

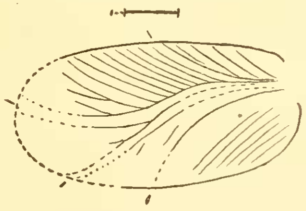


FIG. 99.—POROBLATTINA BRACHYPTERA.

Front wing, 9 mm. long; twice as long as broad. Radius with about 11 branches, the first 8 of which are simple.

Holotype.—Cat. No. 38637, U.S.N.M.

POROBLATTINA LATA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation; shales above the Ames limestone.

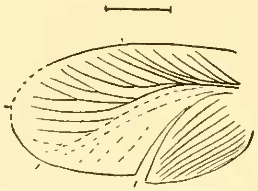


FIG. 100.—POROBLATTINA LATA.

Front wing, 9 mm. long; 1¾ times as long as broad. Radius with 2 simple, one 3-parted, and 2 furcate branches.

Holotype.—Cat. No. 38696, U.S.N.M.

POROBLATTINA ARCUATA Scudder.

Poroblattina arcuata SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 39; Mem. Boston Soc., IV, 1890, p. 466, pl. XLI, fig. 5.

Locality.—Fairplay, Colorado. Lower Permian.

POROBLATTINA RICHMONDIANA, new species.

Locality.—Wills Creek, near Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

Front wing, 9 mm. long; more than twice as long as wide. Radius with 7 branches, the first, third, fourth, and fifth of which are simple, the second and seventh furcate, while the sixth is thrice divided.

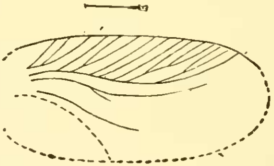


FIG. 101.—POROBLATTINA RICHMONDIANA.

Holotype.—Cat. No. 38644, U.S.N.M.

POROBLATTINA LAKESII Scudder.

Poroblattina lakesii SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 39; Zittel's Handbuch, 1885, p. 755, fig. 936; Mem. Boston Soc., IV, 1890, p. 466, pl. XLI, fig. 11.

Locality.—Fairplay, Colorado. Lower Permian.

? SYSTOLOBLATTA, new genus.

A doubtful genus and perhaps to be united with the foregoing one. According to the drawing it is to be inferred that the wing which I here class is somewhat longer, being about 2½ times as long as broad.

The radius appears to extend to the apical margin, but is gently curved, and notwithstanding this continues down toward the middle of the wing. The media divides about in the middle of the wing, and the cubitus is very much reduced. No cross veins.

? SYSTOLOBLATTA OHIOENSIS (Scudder).

Poroblattina ohioensis SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 138, pl. XI, fig. 2.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

Family MESOBLATTINIDÆ, new family.

This family, which is very feebly represented in the Paleozoic, but is very abundantly developed in the Mesozoic, is characterized by a most remarkable reduction of the costal area, the place of which the radius with its branches now fills. The media is free and is divided in various ways, as is also the cubitus. Most of the veins of the anal area reach to the inner margin. This group can be quite readily derived from the poroblattinids.

ACMÆOBLATTA, new genus.

Front wing pointed, nearly 3 times as long as broad. Radius reaching nearly to the tip, with very many branches. Media with about 6 simple offshoots branching out forward. Cubitus with about 9 simple (?) branches occupying the middle third of the inner margin. Anal area relatively long and narrow, its veins, at least in part, parallel with the posterior border. No cross veins visible. No intercalary veins.

ACMÆOBLATTA LANCEOLATA, new species.

Locality.—Wills Creek, near Steubenville, Ohio. Conemaugh formation: shales above the Ames limestone.

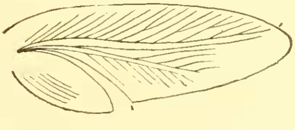


FIG. 102.—ACMÆOBLATTA LANCEOLATA.

Front wing, 10 mm. long. Radius with about 14 mainly simple veins. The first branch of the media originates near the base.

Holotype.—Cat. No. 38678, U.S.N.M.

DICHRONOBLATTA, new genus.

I regard as type of this genus Scudder's *Gerablattina minima*, the neuration of which, according to my view, has been quite erroneously interpreted.

The genus is distinguished from its allies principally by the shorter radius, which does not reach to the tip of the wing; by the more copiously divided media, which arises quite near the base, and by the structure of the cubitus, which, in about the middle of its course, sends out a branch forward and occupies the entire posterior margin. The form of the wing is elliptical, somewhat more than twice as long as broad. The anal area attains about two-fifths the length of the wing and includes numerous veins which end in the inner margin. Traces of cross veins are preserved. Intercalary veins wanting.

DICHRONOBLATTA MINIMA (Scudder).

Gerablattina minima SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, pl. XI, fig. 5.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

NEAROBLATTA, new genus.

Front wing subelliptical, 2½ times as long as broad. Radius arcuate, reaching to the end of the front margin, with many oblique branches extending forward. Media divided into 2 principal branches, whose twigs take up the apical margin and a part of the inner border. Cubitus much reduced, with its few divisions occupying only the middle portion of the posterior margin. Anal area large, limited by a strongly curved fold, with numerous veins fusing in the inner border. Distinct, delicate cross veins. No intercalary veins.

Type of genus, *Nearoblatta parvula* (Goldenberg).

NEAROBLATTA ROTUNDATA (Scudder).

Neorthroblattina rotundata SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 109; Zittel's Handbuch, I, 1885, p. 766, fig. 960; Mem. Boston Soc., IV, 1890, p. 467, pl. XLII, figs. 7, 8.

Locality.—Fairplay, Colorado. Lower Permian.

NEAROBLATTA LAKESII (Scudder).

Neorthroblattina lakesii SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 109; Mem. Boston Soc., IV, 1890, p. 467, pl. XLII, figs. 9, 15.

Locality.—Fairplay, Colorado. Lower Permian.

EPHEBOBLATTA, new genus.

Very similar to the preceding genus, but differs in the shortened radius, which ends far above the apex of the wing; in the strongly developed cubital vein, and also in the pointed form of the front wing, which is almost 3 times as long as broad. The anal area is proportionally short, and its veins run parallel with the anterior margin. Cross veins appear to be wanting. No intercalary veins.

EPHEBOBLATTA ATTENUATA (Scudder.)

Neorthroblattina attenuata SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 110; Mem. Boston Soc., IV, 1890, pp. 467, 468, pl. XLII, fig. 1.

Locality.—Fairplay, Colorado. Lower Permian.

SCUTINOBLATTINA Scudder.

A somewhat doubtful genus. The front wings are pointed. The costal area is reduced and is replaced by the radius, which still reaches out to the posterior border somewhat across the tip. The media appears very much reduced; the cubitus, on the other hand, is normally developed. Anal area large, with numerous veins. Cross and intercalary veins appear to be wanting.

SCUTINOBLATTINA BRONGNIARTI Scudder.

Scutinoblattina brongniarti SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 110; Mem. Boston Soc., IV, 1890, p. 469, pl. XLII, fig. 5.

Locality.—Fairplay, Colorado. Lower Permian.

Family DIECHOBLATTINIDÆ, new family.

This family agrees with the mesoblattinids in the striking reduction of the costal area, but is distinguished from them by a marked degeneration of the media; consequently, in place of the subcosta, the cubitus follows immediately after the encroaching radius, and thus the entire surface of the wing, aside from the normally preserved anal area, is filled up with the branches of these two main veins. The forms of this group are found in small numbers in the Permian and Jura formations.

NEPIOBLATTA, new genus.

Front wing lancet-shaped, more than 2½ times as long as wide. Costal area restricted to a small swelling at the base of the anterior margin, without veins. Radius gently vaulted, extending to the tip, with about 7 in part compound branches directed forward. Cubitus parallel and passing near the main stem of the radius, with about 5 normal, in part furcate, branches running out posteriorly. Anal area large, marked off by a curved suture, in which the majority of the veins fuse. Intercalary veins wanting; cross veins are ? not preserved.

NEPIOBLATTA INTERMEDIA (Scudder).

Scutinoblattina intermedia SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 111; Mem. Boston Soc., IV, 1890, p. 469, pl. XLII, fig. 4.

Locality.—Fairplay, Colorado. Lower Permian.

BREPHOBLATTA, new genus.

Front wing lancet-shaped, somewhat more than 2½ times as long as wide. Radius and cubitus extend nearly parallel and straight through the middle of the wing, and always send out from 4 to 5 in part divided branches to the periphery. The anal area is slender and defined by a gently curved vein. The entire wing is delicately reticulate. Pronotum subcircular.

BREPHOBLATTA RECTA (Scudder).

Scutinoblattina recta SCUDDER, Proc. Acad. Nat. Sci. Phila., 1885, p. 111; Mem. Boston Soc., IV, 1890, p. 469, pl. XLII, figs. 3, 16.

Locality.—Fairplay, Colorado. Lower Permian.

BLATTOIDEA OF DOUBTFUL SYSTEMATIC POSITION.

A. FRONT WINGS.

(BLATTOIDEA) RICHMONDIANA (Scudder).

Gerablattina richmondiana SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 116, pl. X, fig. 1.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

(BLATTOIDEA) STIPATA (Scudder).

Etoblattina stipata SCUDDER, Proc. Boston Soc. XXIV, 1889, p. 50; Bull. U. S. Geol. Surv., No. 124, 1895, p. 98, pl. VIII, fig. 3.

Locality.—Richmond, Ohio. Conemaugh formation; shales above the Ames limestone.

(BLATTOIDEA) LATEBRICOLA (Scudder).

Etoblattina latebricola SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 108, pl. IX, fig. 11.

Locality.—East Providence, Rhode Island. Pennsylvanian; Ten-mile series; Allegheny or Conemaugh stage.

(BLATTOIDEA) sp. Scudder.

Etoblattina sp. SCUDDER, Bull. U. Geol. Surv., No. 101, 1893, p. 18, pl. II, fig. h; No. 124, 1895, p. 77, pl. V, fig. 2.

Locality.—Pawtucket, Rhode Island. Pennsylvanian; Ten-mile series; ? Allegheny or Conemaugh stage.

(BLATTOIDEA) TRIASSICA (Scudder).

Anthracoblattina triassica SCUDDER, Amer. Jour. Sci. (3), XXVIII, 1884, p. 200; Mem. Boston Soc., IV, 1890, p. 464, pl. XLI, fig. 9.

Locality.—Fairplay Colorado. Lower Permian.

(BLATTOIDEA) sp. Scudder.

Etoblattina sp. SCUDDER, Proc. Boston Soc., XXII, 1883, p. 59; Mem. Boston Soc., IV, 1890, p. 460, pl. XLII, fig. 20.

Locality.—Fairplay, Colorado. Lower Permian.

(BLATTOIDEA) ARCTA (Scudder).

Etoblattina arcta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 97, pl. VIII, fig. 5.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38082, U.S.N.M.

(BLATTOIDEA) EXIGUA (Scudder).

Etoblattina exigua SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 76, pl. V, fig. 4.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38080, U.S.N.M.

(BLATTOIDEA) APERTA (Scudder).

Etoblattina aperta SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 80, pl. V, fig. 9.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

Holotype.—Cat. No. 38195, U.S.N.M.

B. HIND WINGS.

(BLATTOIDEA) sp. Scudder.

Etoblattina sp. SCUDDER, Bull. U. S. Geol. Surv., No. 101, 1893, p. 16, pl. II, fig. k; No. 124, 1895, pl. XII, fig. 4.

Locality.—Cranston, Rhode Island. Pennsylvanian; near base of section; stage?

The original is in the collection of the U. S. National Museum (Cat. No. 38070); occasionally many distinct cross veins may be seen.

(BLATTOIDEA) OVALIS (Scudder).

Mylacris ovalis SCUDDER, Mem. Boston Soc., III, 1885, p. 308, pl. XXVII, fig. 5.

Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group; roof of the Middle Kittanning coal.

Cotypes.—Cat. No. 38101, U.S.N.M.

(BLATTOIDEA) sp. Sellards.

Blattide ——— Sellards, Amer. Jour. Sci. (4), XV, 1903, pl. VII, fig. 7.
Etoblattina sp. Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 222, fig. 33.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

This form also appears to have cross veins.

(BLATTOIDEA) sp. Scudder.

Etoblattina sp. Scudder, Bull. U. S. Geol. Surv., No. 101, 1893, p. 13, pl. II, fig. c; No. 124, 1895, p. 110, pl. XII, fig. 2.

Locality.—East Providence, Rhode Island. Pennsylvanian; Tenmile series; Allegheny or Conemaugh stage.

This wing also occasionally shows distinct cross veins.

Specimen in U. S. National Museum. Cat. No. 38072.

(BLATTOIDEA) PACKARDI (Clark).

Blatta americana Clark, Proc. Newport Nat. Hist. Soc., II, 1884, p. 12.
Mylacris packardi Clark, Rand. notes Nat. Hist., II, 1885, p. 64.
Mylacris packardi Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 41, pl. I, figs. 2, 3.

Locality.—Bristol, Rhode Island. Pennsylvanian; ? Allegheny or Conemaugh stage.

Likewise with distinct cross veins.

(BLATTOIDEA) sp. Scudder.

——— ——— Scudder, Mem. Boston Soc., III, 1879, p. 128, pl. VI, fig. 13.

Locality.—Cannelton, Pennsylvania. Allegheny formation; Kittanning group; roof of the Middle Kittanning coal.

(BLATTOIDEA) sp. Sellards.

Etoblattina sp. Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 222, fig. 34, pl. I, fig. 9.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

(BLATTOIDEA) sp. Sellards.

Etoblattina sp. Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 222, fig. 35, pl. I, fig. 8.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

(BLATTOIDEA) sp. Scudder.

Etoblattina sp. Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, pl. XII, fig. 7.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

This wing shows distinct cross veins, and anal area doubled under.

Specimen in U. S. National Museum. Cat. No. 38086.

(BLATTOIDEA) sp. Scudder.

Etoblattina sp. SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, pl. XII, fig. 6.

Locality.—Cassville, West Virginia. Dunkard formation; Lower Permian.

C. BODY PARTS.

(BLATTOIDEA) sp. Scudder.

Body of cockroach" SCUDDER, Bull. U. S. Geol. Surv., No. 124, 1895, p. 25, pl. XII, figs. 8 to 11.

Locality.—Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

(BLATTOIDEA) sp. Sellards.

"*Pronotum of a cockroach*" SELLARDS, Amer. Jour. Sci. (4), XVIII, 1904, p. 133, fig. 24.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

D. YOUNG STAGES.

The connection between nymphs and imagoes appears to me in no case proved. Moreover we have as yet far too few stages to enable us to determine the genus of nymphs, because hitherto a relatively very small number of such fossils have been found and described. I therefore consider it advisable to cite here all the previously observed forms and leave their interpretation to the future.

(BLATTOIDEA) sp. Sellards.

? Egg case of cockroach SELLARDS, Amer. Jour. Sci. (4), XVIII. 1904, p. 134, fig. 25.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

This fossil really looks very similar to an egg sack. Moreover, such forms have already been found in Europe.

(BLATTOIDEA) DIPELTIS DIPLODISCUS Packard.

Dipeltis diplodiscus PACKARD, Amer. Nat., XIX, 1885, p. 293; Mem. Acad. Nat. Sci., III, 1886, p. 145, pl. V, figs. 2, 2a.

Dipeltis diplodiscus SCHUCHERT (part), Proc. U. S. Nat. Mus., XIX, 1897, p. 672, pl. LVIII, figs. 2, 3 (not figs. 4, 5).

Mylacris diplodiscus SELLARDS, Amer. Jour. Sci. (4), XV, 1903, p. 309, pl. VII, fig. 8.

Mylacris (*Dipeltis*) *diplodiscus* SELLARDS (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 124, fig. 4 (not figs. 2, 3), pl. I, fig. 3.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Even though the blattoid nature of this fossil can not be questioned, it still seems to me unproved that the specimen pertains to a mylacrid nymph, because other equally wide blattoid forms occur, which do not belong to the mylacrids. The venation is not discernible (in the figures).

Holotype and plesiotype.—Cat. Nos. 25924 and 38864, U.S.N.M.

(BLATTOIDEA) MELANDERI, new species.

Mylacris (Dipeltis) diplodiscus Melander (not Packard), Jour. Zool. (2), XI, 1903, p. 185, pl. v, fig. 6; pl. vii, fig. 6.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

(BLATTOIDEA) SCHUCHERTIANA, new species.

Dipeltis diplodiscus Schuchert (not Packard) (part), Proc. U. S. Nat. Mus., XIX, 1897, p. 672, pl. lviii, figs. 4, 5 (not figs. 2, 3).

Mylacris (Dipeltis) diplodiscus Sellards (not Packard) (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 124, fig. 2 (not figs. 3, 4).

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

Holotype.—Cat. No. 25925, U.S.N.M.

(BLATTOIDEA) SELLARDSII, new species.

Mylacris (Dipeltis) diplodiscus Sellards (not Packard) (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 124, fig. 3 (not figs. 2, 4).

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

All these larval forms may belong to different species.

(BLATTOIDEA) ANCEPS (Sellards).

Mylacridæ ——— Sellards, Amer. Jour. Sci. (4), XV, 1893, p. 309, pl. vii, fig. 9.

Mylacris anceps Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 129, fig. 5.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

(BLATTOIDEA) SELLARDSIANA, new species.

Mylacris elongata (nymph) Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 125, figs. 6, 7.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning? (Allegheny) stage.

The association of this nymph with *Mylacris elongata* Scudder appears to me not proved.

(BLATTOIDEA) CARRI (Schuchert).

Dipeltis carri Schuchert, Proc. U. S. Nat. Mus., XIX, 1897, p. 671.

Dipeltis carri Sellards, Amer. Jour. Sci. (4), XV, 1903, p. 309.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittaning? (Allegheny) stage.

(BLATTOIDEA) sp. Sellards.

Etoblattina sp. Sellards, Amer. Jour. Sci. (4), XV., 1903, pl. vii, fig. 5.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

(BLATTOIDEA) SCHUCHERTI, new species.

Locality.—Sharp Mountain Gap, 2 miles south of Tremont (Mammoth), Pennsylvania. Anthracite series; stage?

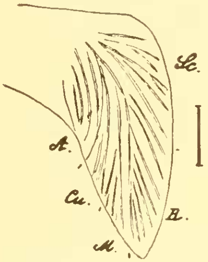


Fig. 103.—Blattoidea schucherti.

A wing pad 7 mm. long, with pointed end. The 5 branches of the subcosta are distinctly seen radiating from one point as in typical mylacrids; further, the radius with 7 branches proceeding obliquely forward. The media sends several branches backward, as does the cubitus. The anal area is longitudinally extended and shows 4 veins.

Holotype.—Cat. No. 38740, U.S.N.M.

(BLATTOIDEA) sp. Handlirsch.

Etoblattina mazona Sellards (part), Amer. Jour. Sci. (4), XV, 1904, p. 309, pl. vii, figs. 1, 2; XVIII, 1904, p. 129, fig. 14.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ?(Allegheny) stage.

? (BLATTOIDEA) sp. Handlirsch.

Etoblattina mazona Sellards (part), Amer. Jour. Sci. (4), XV, 1903, p. 309, pl. vii, figs. 3, 4; XVIII, 1904, p. 129, fig. 13, pl. i, fig. 2.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ?(Allegheny) stage.

Unfortunately the photographic representation of this form (Plate i, fig. 2) is so indistinctly reproduced that I can not clearly distinguish the so-called "ovipositor," which is so very sharply defined in the schematic figure. For this reason I do not believe in its existence, and furthermore do not consider it determined that these larval forms belong to *Etoblattina mazona* Sellards. It may be that they actually pertain to a protoblattoid form and not at all to a true blattoid; possibly to a Protorthopteron. On no account, however, does it seem to me admissible, from such a specimen, to establish the hypothesis that the entire Protoblattariæ had ovipositors and were accordingly derived from locust-like ancestors; for it could not perhaps be shown that the "ovipositor" in question is nothing but an excrement. Moreover, in regard to this, let it here be pointed out that in the protoblattoid *Eucænus imaginale* ovipositors are present, which suggests the idea that this larval form, in case it actually possesses an ovipositor, may belong to the Eucænidæ.

(BLATTOIDEA) sp. Handlirsch.

Etoblattina mazona Sellards (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 129, fig. 10.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

(BLATTOIDEA) sp. Handlirsch.

Etoblattina mazona Sellards (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 129, fig. 11.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

This form was taken for a young individual by Sellards, although it is larger than the one designated as more mature.

(BLATTOIDEA) sp. Handlirsch.

Etoblattina mazona Sellards (part), Amer. Jour. Sci. (4), XVIII, 1904, p. 129, fig. 12.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

(BLATTOIDEA) JUVENIS (Sellards).

Etoblattina juvenis Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 131, figs. 17 to 21.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

A number of blattoid nymphs were included under this name.

(BLATTOIDEA) sp. Sellards.

——— ——— Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 134, fig. 23.

Locality.—Lawrence, Kansas. Upper Coal Measures; Le Roy (Lawrence) shales.

INSECTS OF DOUBTFUL POSITION.

PHTHANOCORIS OCCIDENTALIS Scudder.

Phthanocoris occidentalis Scudder, Proc. Boston Soc., XXII, 1883, p. 58; Mem. Boston Soc., III, 1885, p. 348, pl. xxxii, fig. 4.

Locality.—Kansas City, Missouri. Chanute shales; Conemaugh ? stage.

Through various manipulations the original is somewhat disfigured, and in consequence seems actually like a hemipteran wing, while the counterpart makes a quite different impression. In all probability it may belong to a Protorthopteron or to a similar form.

Cotypes.—Cat. No. 38157, U.S.N.M.

MEGATHENTOMUM PUSTULATUM Scudder.

Megathentomum pustulatum Scudder, Geol. Surv. Illinois, III, 1868, p. 570, fig. 1, Mem. Boston Soc., III, 1885, p. 346, pl. xxxii, figs. 1, 9, 10.

Megathentomum pustulatum Brongniart, Bull. Soc. Rouen (3), XXI, 1885, p. 60.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian, Kittanning ? (Allegheny) stage.

This gigantic insect has been placed by authors in most heterogeneous groups, but in my opinion it will only be rightly interpreted when an entire example, with the base and the posterior margin of the wing, is at hand.

Holotype.—Cat. No. 38145, U.S.N.M.

PROTODICTYON PULCHRIPENNE Melander.

Protodictyon pulchripenne Melander, Jour. Geol., XI, 1903, p. 196, pl. vi, fig. 7, pl. vii, fig. 17.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

The defective drawing renders this incapable of interpretation.

PARAHAPLOPHLEBIUM, new genus.

PARAHAPLOPHLEBIUM LONGIPENNIS Scudder.

Haplophlebium longipennis Scudder, Proc. Amer. Acad., XX, 1885, p. 172; Bull. Soc. Rouen (3), XXI, 1885, p. 61.

Locality.—Pittston, Pennsylvania. Carboniferous.

Certainly does not belong in the genus *Haplophlebium.*

Cotypes.—Cat. No. 38097, U.S.N.M.

(GERARUS ?) ——— Scudder.

Gerarus ? Scudder, Mem. Boston Soc., III, 1885, p. 345, pl. xxxii, fig. 5.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian, Kittanning ? (Allegheny) stage.

Too imperfectly preserved.

PSEUDOPOLYERNUS, new genus.

PSEUDOPOLYERNUS LAMINARUM (Scudder.)

Polyernus laminarum Scudder, Mem. Boston, Soc., III, 1885, p. 343, pl. xxxi, fig. 1.

Locality.—Pittston, Pennsylvania. (? Near top of Pottsville; Upper Transition group.)

At all events this should not be placed in the genus *Polyernus*. Probably a Protorthopteron or a protoblattoid.

Cotypes.—Cat. No. 38155, U.S.N.M.

PSEUDOGERARUS, new genus.

PSEUDOGERARUS SCUDDERI, new species.

Gerarus? SCUDDER, Mem. Boston Soc., III, 1885, p. 344, pl. XXXII, fig. 3.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

Holotype.—Cat. No. 38151. U.S.N.M.

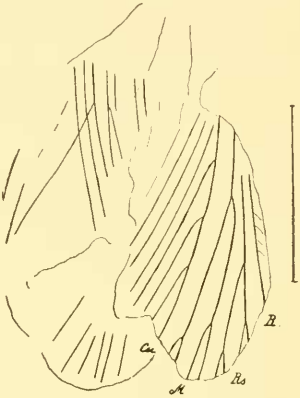


FIG. 104.—PSEUDOGERARUS SCUDDERI.

CHRESTOTES Scudder.

CHRESTOTES LAPIDEA Scudder.

Chrestotes lapidea SCUDDER, Geol. Surv., Illinois, III, 1868, p. 567, fig. 2; Mem. Boston Soc., III, 1885, p. 341, pl. XXXI, fig. 2.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

This species is to be regarded as the type of the genus *Chrestotes*. The form may belong to the protorthopteres.

? CHRESTOTES DANÆ (Scudder).

Miamia danæ SCUDDER, Geol. Surv., Illinois, III, 1868, p. 566, fig. 1.
Gerarus danæ SCUDDER, Mem. Boston Soc., III, 1885, p. 345, pl. XXXI, fig. 5.
Chrestotes danæ BRONGNIART, Bull. Soc. Rouen (3), XXI, 1885, p. 66.
Gerarus danæ MELANDER, Jour. Geol., XI, 1903, p. 197.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

This form may belong in the genus *Chrestotes*.

AXIOLOGUS, new genus.

AXIOLOGUS THORACICUS, new species.

"Allied to *Hemeristia occidentalis*" SCUDDER, Mem. Boston Soc., III, 1885, p. 342, pl. XXXI, fig. 8.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

An insect about 30 mm. long, with broad wings folded over one another, and a pear-shaped elongated pronotum. The venation of the hind wing only can be made out, and in this we distinguish the 3 nearly parallel veins, costa, subcosta, and radius; further, a media furcating above the middle of the wing, and a long, arcuate cubitus curving backward, with several branches directed posteriorly. The anal area was evidently plaited, and contains a large number of veins spread out fanlike.

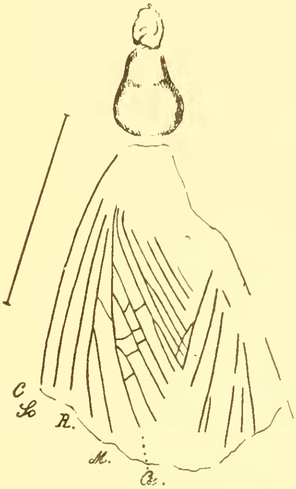


FIG. 105.—AXIOLOGUS THORACICUS.

Probably this form belongs to the protorthopteres or protoblattoids.

Holotype.—Cat. No. 38137, U.S.N.M.

ENDOIASMUS, new genus.

ENDOIASMUS RETICULATUS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

A portion of an insect about 45 mm. long. The wings lie over one another and cover the abdomen. On one wing, which I regard as a hind wing, are seen an abridged subcosta and an unbranched radius reaching nearly to the apex, the sector of which takes rise near the base of the wing and sends out 3 oblique branches to the apical border. The media stretches obliquely to the inner margin and forms a large fork. After this follow several sloping veins, which I can not interpret.

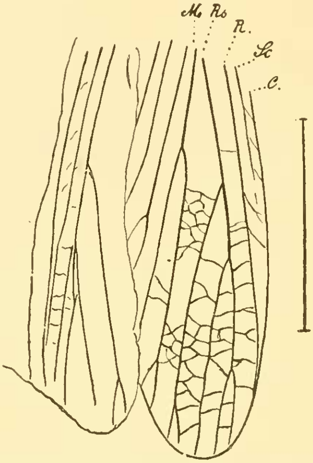


Fig. 106.—Endoiasmus reticulatus.

Between the veins, coarse, occasionally reticulate, curved, irregular cross veins are to be seen.

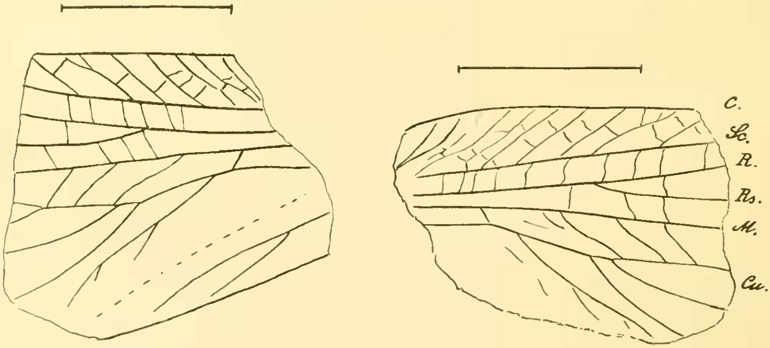
This form may belong to the protorthopteres or to the protoblattoids.

Holotype.—Cat. No. 38819, U.S.N.M.

ARCHIMASTAX, new genus.

ARCHIMASTAX AMERICANUS, new species.

Locality.—Lemons Coal Bank, near Fayetteville, Arkansas. Middle Pottsville; Lower Coal-bearing shale?



Figs. 107, 108.—Archimastax americanus.

A fragment, about 24 mm. long, of a wing at least twice this length. Costa marginal; costal area wide; subcosta with many oblique veinlets directed forward, which are united by cross veins. The radius sends out its sector above the middle of the wing. The media, as far as visible, is not branched. Then follows a vein whose curve is slightly S-shaped, and which gives off several branches backward; this is probably the cubitus. Below this vein lies a broad open area through which a fold appears to extend, and still below this is to be seen a very sloping furcate vein (? anal 1) directed toward the posterior margin. Cross veins distant and irregular.

Holotype.—Impression and reverse in the U. S. National Museum: Cat. Nos. 38711, 38712.

This form may either belong to the protorthopteres or may constitute a distinct group of the Palaeodictyoptera, which might be united with the paoliins. It likewise somewhat recalls *Palaeomastax carbonis* from Belgium.

ARCHÆOLOGUS, new genus.

ARCHÆOLOGUS FALCATUS, new species.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

The basal portion of a front and hind wing, whose length may amount to about 45 mm. The anterior margin of the front wing is distinctly curved. Costa marginal; costal area broad; subcosta not reaching to the apex, with oblique veinlets directed anteriorly, between which cross veins may be observed. Radius not far removed from the subcosta. Radial sector arising below the middle of the wing. Media, as far as visible, not divided. Cubitus separating near the base into 2 main branches, the superior of which is joined to the media by an oblique cross vein. First anal vein not strongly arched. Hind wing evidently with enlarged anal area. Cross veins irregular, widely separated.

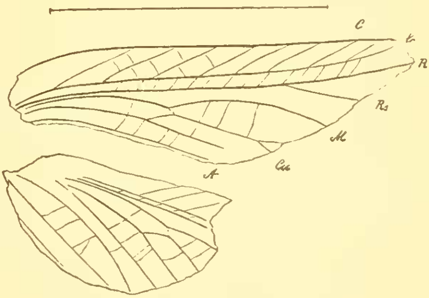


FIG. 109.—ARCHÆOLOGUS FALCATUS.

This form may belong to the protorthopteres or to the protoblattoids.

Holotype.—Cat. No. 38818, U.S.N.M.

HEMERISTIA OCCIDENTALIS Dana.

Hemeristia occidentalis DANA, Amer. Jour. Sci. (2), XXXVII, 1864, p. 35, fig. 2.
Hemeristia occidentalis SCUDDER, Mem. Boston Soc., I, 1866, p. 191, pl. VI, figs. 1, 3.

Locality.—Morris, Illinois. Pennsylvanian: Kittanning ? (Allegheny) stage.

This form is to be regarded as the type of the genus *Hemeristia*.

Plesiotype.—Cat. No. 38137, U.S.N.M.

? *Palæoblattariæ* Scudder, Mem. Boston Soc., III, 1879, p. 128, pl. vi, fig. 11.

Locality.—Sydney, Cape Breton. Middle Coal formation; Allegheny stage?

A very imperfect fragment of a wing.

DIDYMOPHLEPS CONTUSA (Scudder).

Termes contusus Scudder, Proc. Boston Soc., XIX, 1878, p. 300.

Didymophleps contusa Scudder, Mem. Boston Soc., III, 1885, p. 330, pl. xxix, fig. 6.

Goldenbergia contusa Brongniart, Bull. Soc. Rouen (3), XXI, 1885, p. 61.

Locality.—Vermilion County, Illinois. Pennsylvanian; Allegheny stage?

Too imperfectly preserved.

Mantis ? Scudder, Geol. Surv. Illinois, III, 1868, p. 567, fig. 3.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

Is probably an insect, but certainly no *Mantis*, yet can not be more accurately determined.

ARCHEGOGRYLLUS PRISCUS Scudder.

Archegogryllus priscus Scudder, Proc. Boston Soc., XI, 1868, p. 402; Mem. Boston Soc., III, 1885, p. 323, pl. xxix, figs. 2, 3.

Locality.—Tallmadge, Ohio. Upper Pottsville; Sharon shales.

Scudder himself considered this form obscure, but nevertheless placed it in the group of the protophasmids.

CERCOPYLLIS JUSTICIÆ Scudder.

Cercopyllis justiciæ Scudder, Mem. Boston Soc., IV, 1890, p. 471, pl. xlii, fig. 6.

Locality.—Fairplay, Colorado. Lower Permian.

CERCOPYLLIS DELICATULA Scudder.

Cercopyllis delicatula Scudder, Mem. Boston Soc., IV, 1890, p. 471, pl. xlii, fig. 11.

Locality.—Fairplay, Colorado. Lower Permian.

CERCOPYLLIS ADOLESCENS Scudder.

Cercopyllis adolescens Scudder, Mem. Boston Soc., IV, 1890, p. 472, pl. xlii, fig. 12.

Locality.—Fairplay, Colorado. Lower Permian.

The 3 last-named forms were regarded as cercopids by Scudder, but why this was done no reason is to be found, for they could as well be fragments of blattoids.

FOSSILS WRONGLY IDENTIFIED AS INSECTS.

"EUEPHEMERITES SIMPLEX" Scudder.

Euphemerites simplex Scudder, Geol. Surv. Illinois, III, 1868, p. 571, fig. 8.
Euephemerites simplex Lacoe, List Pal. Foss. Ins., 1883, p. 7.
Ephemerites simplex Scudder, Mem. Boston Soc., III, 1885, p. 350.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

"EUEPHEMERITES GIGAS" Scudder.

Euphemerites gigas Scudder, Geol. Surv. Illinois, III, 1868, p. 571, fig. 9.
Euephemerites gigas Lacoe, List Pal. Foss. Ins., 1883, p. 7.
Ephemerites gigas Scudder, Mem. Boston Soc., III, 1885, p. 350.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

"EUEPHEMERITES AFFINIS" Scudder.

Euphemerites affinis Scudder, Geol. Surv. Illinois, III, 1868, p. 572, fig. 10.
Euephemerites affinis Lacoe, List Pal. Foss. Ins., 1883, p. 7.
Ephemerites affinis Scudder, Mem. Boston Soc., III, 1885, p. 350.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

"EUEPHEMERITES PRIMORDIALIS" Scudder.

Euephemerites primordialis Scudder, Proc. Boston Soc., XIX, 1878, p. 248.

Locality.—Pennsylvania ? Carboniferous.

All these fossils were finally pronounced plant remains by Scudder himself.

"MYLACRIDÆ ?" ——— Scudder.

Mylacridæ sp. Scudder, Bull. U. S. Geol. Surv., No. 124, 1895, p. 55, pl. II, fig. 4.
Archoblattina beecheri, Sellards, Amer. Jour. Sci. (4), XVIII, 1904, p. 218.

Locality.—Mazon Creek, near Morris, Illinois. Pennsylvanian; Kittanning ? (Allegheny) stage.

I consider this fossil excluded from the insects.

"LIBELLULA CARBONARIA" Scudder.

Libellula carbonaria Scudder, Canad. Nat. (2), VIII, 1876, pp. 88–89, text fig.

Locality.—Cape Breton, Nova Scotia. Carboniferous.

Was later regarded as a spider by Scudder himself.

? ——— ——— Scudder.

——— ——— Scudder, Mem. Boston Soc., III, 1883, p. 350, pl. XXIII, fig. 2.

Locality.—Near Pittston, Pennsylvania. Coal C of the Boston Mine. Near top of the Pottsville series; Upper Transition group.

May be the remains of a plant.

Specimen in U. S. National Museum. Cat. No. 38099.

"ARCHÆSCOLEX CORNEUS" Matthew.

Archæscolex corneus Matthew, Trans. Roy. Soc. Canada, IV, 1889, p. 59, pl. IV, fig. 11.

Locality. St. John, New Brunswick. Little River group.

Probably belongs to the myriapods.

"PODURITES SALTATOR" Matthew.

Podurites saltator Matthew, Trans. Roy. Soc. Canada (2), I (IV), 1895, p. 273, pl. II, fig. 10.

Locality.—St. John, New Brunswick. Little River group.

Can not possibly be a podurid and probably belongs to the arachnids (*Geralinura*, etc.?).

"GERACUS TUBIFER" Matthew.

Geracus tubifer Matthew, Bull. Soc. New Brunswick, XV, 1897, p. 55.

Locality.—St. John, New Brunswick. Little River group.

In any event, this is neither a podurid nor an insect.

The horizontal distribution of American Paleozoic insects.[a]

Orders and families of Paleozoic insects.	Pennsylvanian.						Permian.	Represented in the Mesozoic.	Represented in the European Paleozoic.
	Pottsville.			Coal measures.					
	I.	II.	III.	IV.	V.	VI.	VII.		
	Quinnimont. Lower Lykens series.	Sewell. Upper Lykens series.	Kanawha series. Mercer group. Connoquenessing shales. Upper Transition series.	Allegheny (Kittanning). Anthracite series. Coal C, D.	Allegheny (Freeport). Anthracite series. Coal E.	Conemaugh.	Dunkard. (Lower Permian.)		
Order Paleodictyoptera	4	2	9	10	1	1	......	—	+
Family Dictyoneuridæ	......	......	2	4	......	1	......	—	+
Hypermegethidæ	......	......	......	......	......	......	......	......	......
Lithomantidæ	......	1	1	......	......	......	......	—	+
Lycocercidæ	......	......	1	......	......	......	......	—	+
Homothetidæ	......	......	1	......	......	......	......	—	—
Heolidæ	......	......	......	......	1	......	......	—	—
Polycreagridæ	......	......	......	1	......	......	......	—	—
Eubleptidæ	......	......	......	1	......	......	......	—	—
Metropatoridæ	1	......	......	......	......	......	......	—	—
Paoliidæ	2	......	......	1	......	......	......	—	—
Ænigmatoidæ	......	......	......	......	......	......	......	—	—
(Incertæ sedis)	1	1	4	3	......	......	......	......	......
Order Protodonata	......	......	1	......	1	......	......	—	+
Order Megasecoptera	......	......	......	2	......	......	......	—	+
Order Hadentomoidea	......	......	......	1	......	......	......	—	—
Order Hapalopteroidea	......	......	......	1	......	......	......	—	—
Order Mixotermitoidea	......	......	1	......	......	......	......	—	+
Order Protorthoptera	......	......	1	18	......	1	......	—	+
Family Spanioderidæ	......	......	1	9	......	1	......	—	—
Œdischiidæ	......	......	......	2	......	......	......	—	+
Gerаridæ	......	......	......	7	......	......	......	—	—

[a] Species of doubtful geologic age are placed in the strata in which they probably belong. The figures signify the number of known species, —, not represented, +, present.

The horizontal distribution of American Paleozoic insects—Continued.

Orders and families of Paleozoic insects.	Pennsylvanian.						Permian.		
	Pottsville.			Coal measures.					
	I.	II.	III.	IV.	V.	VI.	VII.		
	Quinnimont. Lower Lykens series.	Sewell. Upper Lykens series.	Kanawha series. Mercer group. Conoquenessing shales. Upper Transition series.	Allegheny (Kittanning). Anthracite series. Coal C, D.	Allegheny (Freeport). Anthracite series. Coal E.	Conemaugh.	Dunkard. (Lower Permian.)	Represented in the Mesozoic.	Represented in the European Paleozoic.
Order Protoblattoidea				17		6		—	+
Family Oryctoblattidæ				1		5		—	+
Ætophlebidæ				1				—	—
Cheliphlebidæ				1				—	—
Eucænidæ				1				—	—
Gerapompidæ				3				—	—
Adiphlebidæ				2				—	—
Anthracothremmidæ				1				—	—
(Incertæ sedis)				4		1			
Order Blattoidea			4	56	37	73	93	+	
Family Archimylacridæ			4	19	6	12	60	—	+
Spiloblattinidæ						38	17	—	
Mylacridæ				21	26	3		—	+
Dictyomylacridæ						1		—	—
Neomylacridæ					3			—	—
Pteridomylacridæ					1			—	—
Idiomylacridæ					1			—	—
Neorthroblattinidæ							1	—	—
Poroblattinidæ						4	2	—	—
Mesoblattinidæ						2	1	+	+
Diechoblattinidæ							2	+	+
(Incertæ sedis)				16		13	7		
Summary of classified species	4	2	16	105	39	81	93		
Insects not classified		1	2	12	2	1	3		

The foregoing table presents a series of noteworthy facts. We here see that nearly all the orders occurring in America have likewise been already recognized in analogous European beds; in like manner almost all the families rich in forms have been identified in both parts of the world. In such groups as first exist in single individuals, no sort of conclusion as to their actual horizontal distribution can obviously be drawn, and it consequently follows that there is a striking agreement in the Paleozoic fauna in both continents. Only one order (Blattoidea) represented in the Paleozoic of America extends over into the Mesozoic, with two families, while all other orders are replaced in the younger formations by those more highly specialized.

Moreover, from a percentile comparison of the number of forms represented in the single orders in the various formations of the Paleozoic, it follows that the Paleodictyoptera, which on morphological grounds I consider the stem group of all winged insects, appear first and decrease from the oldest beds to the younger, while the more highly specialized orders (Prodonata, Megasecoptera, Hadentomoidea, Hapalopteroidea, Mixotermitoidea, Protorthoptera, and Protoblattoidea), which I regard as connecting links between the Paleodictyoptera and modern insect groups, and which may be designated *transitional* groups, appear later than their conjectural ancestors, attain their maximum in the middle beds, and with the close of the Paleozoic again vanish. It follows finally that the single modern order, thus far found in the American Paleozoic, the Blattoidea, first makes its appearance toward the middle of this period and continues with progressive increase to the close.

The following table should make clear the fact last mentioned:

Orders of insects.	Pennsylvanian.						Permian.
	Pottsville.			Coal Measures.			
	I. Quinnimont. Lower Lykens series.	II. Sewell. Upper Lykens series.	III. Kanawha series. Mercer group. Connoquenessing shales. Upper Transition series.	IV. Allegheny (Kittanning). Anthracite series. Coal C, D.	V. Allegheny (Freeport). Anthracite series. E Coal.	VI. Conemaugh.	VII. Dunkard. (Lower Permian).
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Paleodictyoptera	100	100	56.25	9.52	2.56	1.23	0
(Transitorial groups.)							
Protodonata, Megasecoptera, Hadentomoidea, Hapalopteroidea, Mixotermitoidea, Protorthoptera, Protoblattoidea	0	0	18.75	37.14	2.5	8.64	0
Blattoidea	0	9	25	53.33	94.87	90.12	100

ALPHABETIC LIST OF NAMES.

[The valid designations are printed in roman letters; the synonyms in italics.]

Page.
Acmæoblatta Handlirsch 793
    lanceolata Handlirsch 793
Acosmoblatta Handlirsch 742
    cakiniana (Scudder) 742
    permacra (Scudder) 742
Actinomylacris Handlirsch 773
    carbonum (Scudder) 773
    vicina Handlirsch 774
Adeloblatta Handlirsch 720
    columbiana (Scudder) 721
    ? gorhami (Scudder) 721
Adiaptharsia Handlirsch 691
    ferrea Handlirsch 691
Adiphlebia Scudder 712
    lacoana Scudder 712
    longitudinalis Scudder 712
Adiphlebidæ Handlirsch 712
Ænigmatodes Handlirsch 683
    danielsi Handlirsch 683
Ænigmatodidæ Handlirsch 683
Æthophlebia Scudder 708
    singularis Scudder 708
Æthophlebidæ Handlirsch 708
Agogoblattina Handlirsch 714
    occidua (Scudder) 714
"*Allied to Hemeristia occidentalis*" Scudder 805
Amblyblatta Handlirsch 742
    lata (Scudder) 743
Amblymylacris Handlirsch 782
    clintoniana (Scudder) 782
    harei (Scudder) 782
Ametroblatta Handlirsch 763
    ? longinqua (Scudder) 764
    strigosa (Scudder) 764
Amoeboblatta Handlirsch 740
    permanenta (Scudder) 740
Anomomylacris Handlirsch 772
    cubitalis Handlirsch 772
Anthracoblattina americana Scudder 749
    triassica Scudder 796
    virginiensis Scudder 743
Anthracothremma Scudder 713
    robusta Scudder 713
Anthracothremmidæ Handlirsch 712
Apempherus Handlirsch 744
    complexinervis (Scudder) 745
    fossus (Scudder) 745
? Aphelomylacris Handlirsch 780
    modesta Handlirsch 780
Page.
Aphthoroblattina Handlirsch 719
    fascigera (Scudder) 719
Archæologus Handlirsch 807
    falcatus Handlirsch 807
"Archæscolex corneus" Matthew 810
Archegogryllus Scudder 808
    priscus Scudder 808
Archimastax Handlirsch 806
    americanus Handlirsch 806
Archimylacridæ Handlirsch 717
(Archimylacridæ) coriacea Sellards 751
    eversa Scudder 751
    exilis Scudder 750
    inculta Scudder 750
    jeffersoniana Scudder 750
    meieri Scudder 750
    perita Scudder 750
    sepulta Scudder 750
Archimylacris Scudder 730
    acadica Scudder 730
    parallela Scudder 722
    paucinervis Scudder 719
    venusta Lesquereux 730
Archoblattina Sellards 726
    beecheri (Sellards) 726
    ? scudderi Handlirsch 726
Arrhythmoblatta Handlirsch 763
    detecta (Scudder) 763
    scudderiana Handlirsch 763
Asemoblatta Handlirsch 724
    danielsi Handlirsch 725
    mazona (Scudder) 725
    pennsylvanica Handlirsch 725
Atactoblatta Handlirsch 764
    anomala Handlirsch 764
Atimoblatta Handlirsch 723
    curvipennis Handlirsch 723
    reniformis Handlirsch 724
Axiologus Handlirsch 805
    thoracicus Handlirsch 805
Bathytaptus Handlirsch 686
    falcipennis Handlirsch 686
Blatta americana Clark 798
"*Blattidæ*" Sellards 798
Blattina bretonensis Scudder 784
    fascigera Scudder 719
    heeri Scudder 770
    sepulta Scudder 750
    sp. Scudder 726

Page.

- *Blattina venusta* Lesquereux 730
- Blattinopsis Giebel 706
  - anthracina Handlirsch 706
- Blattoidea Handlirsch 715
- (Blattoidea) anceps Sellards 800
  - aperta Scudder 797
  - arcta Scudder 797
  - carri Schuchert 800
  - Dipeltis diplodiscus Packard 799
  - exigua Scudder 797
  - juvenis Sellards 802
  - latebricola Scudder 796
  - melanderi Handlirsch 800
  - ovalis Scudder 797
  - packardi Clark 798
  - richmondiana Scudder 796
  - schucherti Handlirsch 801
  - schuchertiana Handlirsch 800
  - sellardsiana Handlirsch 800
  - sellardsii Handlirsch 800
  - sp. Handlirsch 801
  - ?sp. Handlirsch 801
  - sp. Handlirsch 802
  - sp. Handlirsch 802
  - sp. Handlirsch 802
  - sp. (Sellards) 798
  - sp. (Sellards) 798
  - sp. (Sellards) 798
  - sp. (Sellards) 799
  - sp. (Sellards) 799
  - sp. (Sellards) 801
  - sp. (Sellards) 802
  - sp. (Scudder) 796
  - sp. (Scudder) 797
  - sp. (Scudder) 797
  - sp. (Scudder) 798
  - sp. (Scudder) 798
  - sp. (Scudder) 798
  - sp. (Scudder) 799
  - sp. (Scudder) 799
  - stipata Scudder 796
  - triassica Scudder 796
- "*Body of cockroach*" Scudder 799
- Brachymylacris Handlirsch 776
  - cordata Handlirsch 776
  - elongata Handlirsch 776
  - mixta Handlirsch 777
  - rotundata Handlirsch 777
- Bradyblatta Handlirsch 741
  - saggittaria (Scudder) 741
- Brephoblatta Handlirsch 796
  - recta (Scudder) 796
- Campteroneura Handlirsch 685
  - reticulata Handlirsch 685

Page.

- Camptophlebia Handlirsch 698
  - clarinervis (Melander) 698
- Cercopyllis Scudder 808
  - adolescens Scudder 808
  - delicatula Scudder 808
  - justiciae Scudder 808
- Chalepomylacris Handlirsch 775
  - pulchra Handlirsch 775
- Cheliphlebia Scudder 709
  - carbonaria Scudder 709
  - *elongata* Scudder 698
  - *extensa* Melander 699
- Cheliphlebidæ Handlirsch 709
- Chrestotes Scudder 804
  - ?danæ Scudder 804
  - lapidea Scudder 804
- Dichronoblatta Handlirsch 794
  - minima (Scudder) 794
- Dicladoblatta Handlirsch 759
  - defossa (Scudder) 759
  - ?marginata (Scudder) 759
  - tenuis (Scudder) 759
  - willsiana (Scudder) 759
- Dictyomylacridæ Handlirsch 785
- Dictyomylacris Brongniart 785
  - multinervis (Sellards) 786
- *Dictyoneura clarinervis* Melander 698
  - *haplophlebia* Goldenberg 670
  - *jucunda* Brongniart 671
- Dictyoneuridæ Handlirsch 670
- Didymophleps Scudder 808
  - contusa Scudder 808
- Diechoblattinidæ Handlirsch 795
- Dieconeura Scudder 699
  - arcuata Scudder 699
  - *maxima* Melander 704
  - *rigida* Scudder 699
- Dieconeurites Handlirsch 699
  - rigidus (Scudder) 699
- Dipeltis Packard 799
  - *carri* Schuchert 800
  - diplodiscus Packard 799
  - *diplodiscus* Schuchert 800
- Discoblatta Handlirsch 749
  - scholfieldi (Scudder) 749
- Distatoblatta Handlirsch 739
  - persistens (Scudder) 739
- Doryblatta Handlirsch 764
  - longipennis Handlirsch 765
- Dyscritus Scudder 684
  - vetustus Scudder 684
- Dysmenes Handlirsch 727
  - illustris (Scudder) 727
- "*Egg case of cockroach*" Sellards 799

Page.

- Endoiasmus Handlirsch, 805
  - reticulatus Handlirsch, 805
- Epheboblatta Handlirsch, 794
  - attenuata (Scudder), 795
- *Ephemerites affinis* Scudder, 809
  - *gigas* Scudder, 809
  - *simplex* Scudder, 809
- *Etoblattina accubita* Scudder, 737
  - *angusta* Scudder, 733
  - *aperta* Scudder, 797
  - *arcta* Scudder, 797
  - *balteata* Scudder, 765
  - *benedicta* Scudder, 753
  - *clarkii* Scudder, 727
  - *clintoniana* Scudder, 782
  - *communis* Scudder, 731, 735
  - *coriacea* Sellards, 751
  - *debilis* Scudder, 744
  - *defossa* Scudder, 759
  - *detecta* Scudder, 763
  - *eakiniana* Scudder, 742
  - *exigua* Scudder, 797
  - *exilis* Scudder, 750
  - *expugnata* Scudder, 733
  - *expulsata* Scudder, 736, 737
  - *expuncta* Scudder, 744
  - *exsecuta* Scudder, 736
  - *exsensa* Scudder, 760
  - *fasciata* Scudder, 757
  - *fossa* Scudder, 740
  - *funeraria* Scudder, 733
  - *funesta* Scudder, 755
  - *gorhami* Scudder, 721
  - *gracilenta* Scudder, 752, 761
  - *gratiosa* Scudder, 736
  - *hastata* Scudder, 757
  - *hilliana* Scudder, 738
  - *hilliana?* Sellards, 739
  - *hustoni* Scudder, 761
  - *illustris* Scudder, 727
  - *immolata* Scudder, 736
  - *imperfecta* Scudder, 737
  - *invisa* Scudder, 759
  - *jeffersoniana* Scudder, 750
  - *juvenis* Sellards, 802
  - *lata* Scudder, 733
  - *latebricola* Scudder, 796
  - *lesquereuxi* Scudder, 720
  - *macerata* Scudder, 737
  - *macilenta* Scudder, 732
  - *mactata* Scudder, 733
  - *maledicta* Scudder, 753, 760
  - *marginata* Scudder, 757
  - *mazona* Scudder, 725

Page.

- *Etoblattina mazona* Sellards, 725, 801, 802
  - *mediana* Scudder, 732
  - *mucronata* Scudder, 732
  - *obatra* Scudder, 734
  - *occidentalis* Scudder, 739
  - *occulta* Scudder, 758
  - *ovata* Scudder, 732
  - *patiens* Scudder, 758
  - *persistens* Scudder, 739
  - *prædulcis* Scudder, 738
  - *ramosa* Scudder, 754
  - *recidiva* Scudder, 758
  - *reliqua* Scudder, 714
  - *residua* Scudder, 733
  - *rogi* Scudder, 738
  - *sagittaria* Scudder, 741
  - *scholfieldi* Scudder, 749
  - *secreta* Scudder, 736, 737
  - *sp.* Sellards, 798
  - *sp.* Sellards, 798
  - *sp.* Sellards, 798
  - *sp.* Sellards, 801
  - *sp.* Scudder, 796
  - *sp.* Scudder, 797
  - *sp.* Scudder, 797
  - *sp.* Scudder, 798
  - *sp.* Scudder, 798
  - *sp.* Scudder, 799
  - *stipata* Scudder, 796
  - *strigosa* Scudder, 764
  - *tenuis* Scudder, 759
  - *variegata* Scudder, 754
  - *venusta* Scudder, 730
  - *willsiana* Scudder, 759
- Eubleptidæ Handlirsch, 679
- Eubleptus Handlirsch, 680
  - danielsi Handlirsch, 681
- Eucænidæ Handlirsch, 709
- Eucænus Scudder, 710
  - attenuatus Melander, 710
  - mazonus Melander, 710
  - ovalis Scudder, 710
  - rotundatus Handlirsch, 710
- Euephemerites Scudder, 809
  - affinis Scudder, 809
  - gigas Scudder, 809
  - primordialis Scudder, 809
  - simplex Scudder, 809
- Eumorphoblatta Handlirsch, 728
  - heros (Scudder), 729
- *Euphemerites affinis* Scudder, 809
  - *gigas* Scudder, 809
  - *simplex* Scudder, 809
- Eurytænia Handlirsch, 674

Page
Eurytænia virginiana Handlirsch 674
Eurythmopteryx Handlirsch 675
antiqua Handlirsch 675
Exochoblatta Handlirsch 741
hastata (Scudder) 742
Exochomylacris Handlirsch 767
virginiana Handlirsch 768
Genentomum Scudder 700
validum Scudder 700
Genopteryx Scudder 704
constricta Scudder 704
Gerablattina abdicata Scudder 732
apicalis Scudder 757
arcuata Scudder 752
balteata Scudder 765
cassvici Scudder 758
concinna Scudder 737, 738
deducta Scudder 732
diversipennis Scudder 758
eversa Scudder 751
fascigera Scudder 719
fraterna Scudder 745
inculta Scudder 750
lata Scudder 743
minima Scudder 794
ovata Scudder 741
perita Scudder 750
permacra Scudder 742
permanenta Scudder 740
radiata Scudder 741
richmondiana Scudder 796
rotundata Scudder 743
scapularis Scudder 727
uniformis Scudder 733, 734, 738
"Geracus tubifer" Matthew 810
Gerapompidæ Handlirsch 711
Gerapompus Scudder 711
blattinoides Scudder 711
extensus Scudder 711
schucherti Handlirsch 711
Geraridæ Handlirsch 701
Geraroides Handlirsch 704
maximus (Melander) 704
Gerarus Scudder 702
angustus Handlirsch 703
danæ Scudder 804
danielsi Handlirsch 703
longus Handlirsch 702
mazonus Scudder 703
vetus Scudder 702
?——— Scudder 803
?——— Scudder 804
Gerephemera Scudder 672
simplex Scudder 672

Page.
Geroneura Matthew 695
wilsoni Matthew 695
Glaphyrophlebia Handlirsch 707
pusilla Handlirsch 707
Goldenbergia contusa Brongniart 808
longitudinalis Brongniart 712
Goniomylacris Handlirsch 778
pauper Handlirsch 778
Gyroblatta Handlirsch 726
clarkii (Scudder) 727
? scapularis Scudder 727
Gyrophlebia Handlirsch 697
longicollis Handlirsch 697
Hadentomoidea Handlirsch 692
Hadentomum Handlirsch 693
americanum Handlirsch 693
Hapaloptera Handlirsch 694
gracilis Handlirsch 694
Hapalopteroidea Handlirsch 694
Haplophlebium Scudder 670
barnesii Scudder 670
longipennis Scudder 803
Hemeristia Dana 807
occidentalis Dana 807
Hemimylacris Handlirsch 766
clintoniana (Scudder) 767
ramificata Handlirsch 767
Heolidæ Handlirsch 677
Heolus Handlirsch 677
providentiæ Handlirsch 678
Homothetidæ Scudder 676
Homothetus Scudder 677
erutus Matthew 685
fossilis Scudder 677
Hypermegethes Handlirsch 672
schucherti Handlirsch 673
Hypermegethidæ Handlirsch 672
Idiomylacridæ 789
Idiomylacris Handlirsch 790
gracilis Handlirsch 791
Kinklidoblatta Handlirsch 720
lesquereuxi (Scudder) 720
"Libellula carbonaria" Scudder 809
Liparoblatta Handlirsch 740
ovata Scudder 741
radiata Scudder 741
Lithentomum Scudder 684
harttii Scudder 684
Lithomantidæ Handlirsch 673
Lithomylacris Scudder 781
angusta Scudder 781
pauperata Scudder 783
pittstoniana Scudder 784
simplex Scudder 784

Page.

- Lycocercidæ Handlirsch, 675
- Mammia Handlirsch, 671
  - alutacea Handlirsch, 671
- *Mantis?* Scudder, 808
- *Megablattina beecheri* Sellards, 726
- Megalometer Handlirsch, 713
  - lata Handlirsch, 713
- Megasecoptera Brongniart, 691
- Megathentomum Scudder, 803
  - pustulatum Scudder, 803
- Mesoblattinidæ Handlirsch, 793
- Metacheliphlebia Handlirsch, 698
  - elongata (Scudder), 698
- Metachorus Handlirsch, 747
  - striolatus Handlirsch, 748
  - testudo (Scudder), 747
- Metaxyblatta Handlirsch, 729
  - hadroptera Handlirsch, 730
- Metaxys Handlirsch, 739
  - fossa Scudder, 740
- Metropator Handlirsch, 681
  - pusillus Handlirsch, 682
- Metropatoridæ Handlirsch, 681
- Metryia Handlirsch, 700
  - analis Handlirsch, 700
- Miamia Dana, 698
  - bronsoni Dana, 698
  - *danæ* Scudder, 804
- Microblattina Scudder, 708
  - perdita Scudder, 708
- Mixotermitoidea Handlirsch, 695
- Mylacridæ Scudder, 766
- *Mylacridæ* Sellards, 800
- (Mylacridæ) ampla Scudder, 784, 785
  - bretonensis Scudder, 784
  - carbonina Handlirsch, 784
  - gurleyi Scudder, 785
  - pauperata Scudder, 783
  - pennsylvanica Scudder, 784
  - pittstoniana Scudder, 784
  - priscovolans Scudder, 783
  - pseudo-carbonum Handlirsch, 784
  - rigida Scudder, 785
  - simplex Scudder, 784
- "Mylacridæ?" Scudder, 809
- Mylacris Scudder, 778
  - *ampla* Scudder, 784
  - *anceps* Selards, 800
  - anthracophila Scudder, 779
  - *antiqua* Scudder, 771
  - *bretonensis* Scudder, 784
  - *carbonum* Scudder, 773, 784
  - (*Dipeltis*) *diplodiscus* Melander, 800
  - (*Dipeltis*) *diplodiscus* Sellards, 799, 800
- Mylacris *diplodiscus* Sellards, 799
  - ? dubia Handlirsch, 780
  - elongata Scudder, 779
  - *elongata* Sellards, 779, 800
  - *gurleyi* Scudder, 785
  - *heeri* Scudder, 770
  - *lucifuga* Scudder, 770
  - *mansfieldi* Scudder, 770
  - *ovalis* Scudder, 797
  - *packardi* Clark, 798
  - *pennsylvanica* Scudder, 784
  - *priscovolans* Scudder, 783
  - ? sellardsii Handlirsch, 779
  - similis Handlirsch, 779
- "*Near Cheliphlebia*" Scudder, 697
- Nearoblatta Handlirsch, 794
  - lakesii (Scudder), 794
  - rotundata (Scudder), 794
- Necymylacris Scudder, 749
  - *heros* Scudder, 729
  - lacoana Scudder, 749
- Neomylacridæ Handlirsch, 786
- Neomylacris Handlirsch, 786
  - major Handlirsch, 787
  - paucinervis Handlirsch, 788
  - pulla Handlirsch, 787
- Neorthroblattina Scudder, 790
  - albolineata Scudder, 790
  - *attenuata* Scudder, 795
  - *lakesii* Scudder, 794
  - *rotundata* Scudder, 794
- Neorthroblattinidæ Handlirsch, 790
- Nepioblatta Handlirsch, 795
  - intermedia (Scudder), 795
- "Neuropteroid Fam. Homothetidæ" Scudder, 710
- *Oedischia valida* Brongniart, 700
- Oedischiidæ Handlirsch, 700
- Olethroblatta Handlirsch, 745
  - americana Handlirsch, 746
- Orthogonophora Handlirsch, 686
  - distincta Handlirsch, 686
- Orthomylacris Handlirsch, 768
  - alutacea Handlirsch, 771
  - analis Handlirsch, 768
  - antiqua Scudder, 771
  - elongata Handlirsch, 770
  - heeri Scudder, 770
  - lucifuga Scudder, 770
  - mansfieldi Scudder, 770
  - pennsyvanica Handlirsch, 771
  - pluteus Scudder, 771
  - rugulosa Handlirsch, 769
  - truncatula Handlirsch, 769

Page.
Oryctoblattina Scudder ... 705
  americana Handlirsch ... 706
  laqueata Scudder ... 705
  latipennis Handlirsch ... 706
  occidua Scudder ... 714
Oryctoblattinidæ Handlirsch ... 705
Oxynoblatta Handlirsch ... 748
  alutacea Handlirsch ... 748
  ? americana (Scudder) ... 749
  ? triangularis (Scudder) ... 749
Palæoblatta Handlirsch ... 718
  paucinervis (Scudder) ... 719
? "*Palæoblattariæ*" Scudder ... 808
Palæodictyoptera Goldenberg ... 669
(Palæodictypteron) latipenne Handlirsch ... 688
  mazonum Handlirsch ... 688
  virginianum Handlirsch ... 688
Palæotherates Handlirsch ... 690
  pennsylvanicus Handlirsch ... 690
Palaiotaptus Handlirsch ... 687
  mazonus Handlirsch ... 687
Palephemera antiqua Scudder ... 676
Paolia Smith ... 682
  gurleyi Scudder ... 682
  lacoana Scudder ... 687
  superba Scudder ... 687
  vetusta Smith ... 682
Paoliidæ Handlirsch ... 682
Paracheliphlebia Handlirsch ... 699
  extensa (Melander) ... 699
Parahaplophelbium Handlirsch ... 803
  longipennis (Scudder) ... 803
Paralogus Scudder ... 690
  æschnoides Scudder ... 690
Parapaolia Handlirsch ... 687
  superba (Scudder) ... 687
Pareinoblatta Handlirsch ... 743
  expuncta (Scudder) ... 744
Paromylacris Scudder ... 783
  ampla Scudder ... 785
  clintoniana Scudder ... 767
  ? *pluteus* Scudder ... 771
  rotunda Scudder ... 783
  triangularis Scudder ... 749
Penetoblatta Handlirsch ... 743
  rotundata Scudder ... 743
  virginiensis Scudder ... 743
Petrablattina Scudder ... 750
  æqua Scudder ... 750
  hastata Scudder ... 742
  meieri Scudder ... 750
  sepulta Scudder ... 750

Page.
Petromartus Melander ... 699
  insignis Melander ... 699
Phoberoblatta Handlirsch ... 728
  grandis Handlirsch ... 728
Phthanocoris Scudder ... 802
  occidentalis Scudder ... 802
Phthinomylacris Handlirsch ... 774
  cordiformis Handlirsch ... 774
  medialis Handlirsch ... 775
Phyloblatta Handlirsch ... 731
  abbreviata Handlirsch ... 733
  abdicata (Scudder) ... 732
  accubita (Scudder) ... 737
  angusta (Scudder) ... 733
  arcuata Handlirsch ... 735
  cassvilleana Handlirsch ... 733
  communis (Scudder) ... 731
  concinna (Scudder) ... 737
  debilis Handlirsch ... 736
  deducta (Scudder) ... 732
  dichotoma Handlirsch ... 735
  ? dimidiata Handlirsch ... 738
  elatior Handlirsch ... 735
  expugnata (Scudder) ... 733
  expulsata (Scudder) ... 737
  exsecuta (Scudder) ... 736
  fracta Handlirsch ... 735
  funeraria (Scudder) ... 733
  gratiosa (Scudder) ... 736
  ? hilliana (Scudder) ... 738
  immolata (Scudder) ... 736
  imperfecta (Scudder) ... 737
  lata (Scudder) ... 733
  macerata (Scudder) ... 737
  macilenta (Scudder) ... 732
  macroptera Handlirsch ... 731
  mactata (Scudder) ... 733
  mediana (Scudder) ... 732
  mortua Handlirsch ... 735
  mucronata (Scudder) ... 732
  obatra (Scudder) ... 735
  ? occidentalis (Scudder) ... 739
  ovata (Scudder) ... 732
  prædulcis (Scudder) ... 738
  ? rebaptizata Handlirsch ... 738
  regularis Handlirsch ... 733
  residua (Scudder) ... 733
  rogi (Scudder) ... 738
  scudderiana Handlirsch ... 738
  secreta (Scudder) ... 737
  ? sellardsii Handlirsch ... 739
  uniformis (Scudder) ... 733
  virginiana Handlirsch ... 736

Page.

- Phyloblatta vulgata Handlirsch . . . 736
- Plagioblatta Handlirsch . . . 721
  - campbelli Handlirsch . . . 722
  - parallela (Scudder) . . . 722
- Platephemera Scudder . . . 676
  - antiqua Scudder . . . 676
- "Podurites saltator" Scudder . . . 810
- Polycreagra Handlirsch . . . 678
  - elegans Handlirsch . . . 679
- Polycreagridæ Handlirsch . . . 678
- Polyernus Scudder . . . 714
  - complanatus Scudder . . . 714
  - *laminarum* Scudder . . . 803
- Polyetes Handlirsch . . . 715
  - furcifer Handlirsch . . . 715
- Polyetoblatta Handlirsch . . . 719
  - calopteryx Handlirsch . . . 720
- Poroblattina Scudder . . . 791
  - arcuata Scudder . . . 792
  - brachyptera Handlirsch . . . 791
  - *complexinervis* Scudder . . . 745
  - *fossa* Scudder . . . 745
  - *gratiosa* Scudder . . . 738
  - lakesii Scudder . . . 792
  - lata Handlirsch . . . 792
  - *longinqua* Scudder . . . 764
  - *meieri* Scudder . . . 750
  - *ohioensis* Scudder . . . 793
  - richmondiana Handlirsch . . . 792
- Poroblattinidæ Handlirsch . . . 791
- Progenentomum Handlirsch . . . 701
  - carbonis Handlirsch . . . 701
- *Progonoblattina columbiana* Scudder 721
- Promylacris Scudder . . . 782
  - *harei* Scudder . . . 782
  - ovalis . . . 783
  - *rigida* Scudder . . . 785
  - *rigida* Sellards . . . 785
  - *testudo* Scudder . . . 747
- "*Pronotum of a cockroach*" Sellards . . . 799
- Propteticus Scudder . . . 698
  - infernus Scudder . . . 698
- Protoblattoidea Handlirsch . . . 704
- Protodictyon Melander . . . 803
  - pulchripenne Melander . . . 803
- Protodonata Brongniart . . . 689
- Protorthoptera Handlirsch . . . 695
- Pseudetoblattina Handlirsch . . . 714
  - reliqua (Scudder) . . . 714
- Pseudogerarus Handlirsch . . . 804
  - scudderi Handlirsch . . . 804
- Pseudohomothetus Handlirsch . . . 685

Page.

- Pseudohomothetus erutus (Matthew) . . . 685
- Pseudopaolia Handlirsch . . . 687
  - lacoana (Scudder) . . . 687
- Pseudopolyernus Handlirsch . . . 803
  - laminarum (Scudder) . . . 803
- Pteridomylacridæ Handlirsch . . . 788
- Pteridomylacris Handlirsch . . . 788
  - paradoxa Handlirsch . . . 789
- Pterygogenea Brauer . . . 669
- Rhaphidiopsis Scudder . . . 691
  - diversipenna Scudder . . . 691
- Schizoblatta Handlirsch . . . 722
  - alutacea Handlirsch . . . 723
- *Schizoblattina multinervia* Sellards . . 786
- Scutinoblattina Scudder . . . 795
  - brongniarti Scudder . . . 795
  - *intermedia* Scudder . . . 795
  - *recta* Scudder . . . 796
- Spaniodera Handlirsch . . . 696
  - ambulans Handlirsch . . . 697
- Spanioderidæ Handlirsch . . . 695
- Sphenomylacris Handlirsch . . . 781
  - singularis Handlirsch . . . 782
- Spiloblattina Scudder . . . 762
  - gardineri Scudder . . . 762
  - *gardineri* Scudder . . . 759, 762, 765
  - *guttata* Scudder . . . 758
  - *maledicta* Sellards . . . 753, 765
  - *marginata* Scudder . . . 759
  - perforata Handlirsch . . . 762
  - *sp.* Sellards . . . 766
  - *triassica* Scudder . . . 758
- Spiloblattinidæ Handlirsch . . . 751
- (Spiloblattinidæ) balteata Scudder . 765
  - gardineri Scudder . . . 765
  - sp. . . . 765
  - sp. . . . 766
- Stenomylacris Handlirsch . . . 772
  - elegans Handlirsch . . . 773
- Stygetoblatta Handlirsch . . . 746
  - latipennis Handlirsch . . . 747
- Symphyoblatta Handlirsch . . . 744
  - debilis (Scudder) . . . 744
- SysciobIatta Handlirsch . . . 760
  - anomala Handlirsch . . . 760
  - exsensa (Scudder) . . . 760
  - gracilenta (Scudder) . . . 761
  - hustoni (Scudder) . . . 761
  - minor Handlirsch . . . 760
  - misera Handlirsch . . . 762
  - obscura Handlirsch . . . 760
  - steubenvilleana Handlirsch . . 761

Page.
Sysciophlebia Handlirsch 751
  acutipennis Handlirsch 757
  adumbrata Handlirsch 755
  affinis Handlirsch 753
  apicalis (Scudder) 757
  arcuata (Scudder) 752
  benedicta (Scudder) 753
  cassvici (Scudder) 758
  diversipennis (Scudder) 758
  fasciata (Scudder) 757
  fenestrata Handlirsch 759
  funesta (Scudder) 755
  guttata (Scudder) 758
  hastata (Scudder) 757
  hybrida Handlirsch 753
  invisa (Scudder) 759
  lawrenceana Handlirsch 753
  maledicta (Scudder) 753
  marginata (Scudder) 757
  nana Handlirsch 756
  obtusa Handlirsch 756
  occulta (Scudder) 758
  patiens (Scudder) 758
  picta Handlirsch 754
  ramosa (Scudder) 754

Page.
Sysciophlebia? recidiva (Scudder). 758
  rotundata Handlirsch 755
  schucherti Handlirsch 754
  scudderi Handlirsch 752
  sellardsii Handlirsch 753
  triassica (Scudder) 758
  variegata (Scudder) 754
  whitei Handlirsch 752
? Systoloblatta Handlirsch 792
  ? ohioensis (Scudder) 793
Termes contusus Scudder 808
  longitudinalis Scudder 712
Titanodictya Handlirsch 671
  jucunda (Scudder) 671
Titanophasma jucunda Scudder.... 671
"*Undescribed Blattinariæ*" Sellards 786
Xenoblatta Handlirsch 745
  fraterna (Scudder) 745
Xenoneura Scudder 684
  antiquorum Scudder 684
  ——— ——— Scudder 684, 798
  ——— ——— Sellards 802
  ——— ——— 808
  ——— ——— 808